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## Editorials

### CATTLE PATHOLOGY :: ITS ADVANCES AND ITS NECESSITIES.

THE advances which have been made in the diagnosis and treatments of the diseases of the domesticated animals are many, and those of the cow have taken their place with the others. Infectious epidemics have had such disastrous effects in the past on the agricultural community that of necessity they have had to be studied in all countries, and Great Britain is lucky in that, by its insular position, the Veterinary Department of the Ministry of Agriculture has in this a staunch ally whose value cannot be over estimated. Such plagues as rinderpest and contagious pleuro-pneumonia are not now known here; but the reintroduction of some of them would only be a matter of time if the well-thought-out protective regulations of the Veterinary Department of the Ministry of Agriculture were in any way neglected. Anthrax is persistently with us, but not to anything like the extent to which it exists in some countries, and if only an effectual method could be devised for sterilising such imported products as foreign corn,

cake, hides, and bone manure, in the same way that foreign wool and hair is now sterilised, without detracting from their value, this disease, too, would soon be relegated to a place in the past.

Tuberculosis is being vigorously grappled with and the question of immunisation is now well ahead on its trail. Allusions to practical experiments in this direction will be found in our columns and the results are decidedly encouraging.

Johne's disease, contagious abortion, and sterility are still veritable scourges, and each takes its toll in causing such enormous losses to the breeder and agriculturalist as to rank, in some parts of the country, side by side with tuberculosis in importance. Much work is being done to endeavour to discover reliable preventive measures against these diseases but much more needs to be done before the goal is attained.

It is, quite as much, however, in the every day, humdrum, diseases that we need special assistance from our research workers, whose fortunate position in not having to depend upon capricious clients and irregular rushes of work for the providing of their daily bread enables them to concentrate quietly in well-equipped laboratories on the problems of disease. They, on their part, must have the co-option and collaboration of the workers in the field, for it is the latter who have to fight disease under its natural conditions and in natural surroundings. The one cannot work satisfactorily without the other, and it is only of recent years that the opportunity for original research has been afforded in Great Britain to any appreciable extent to the members of the veterinary profession.

Since the numbers of the horses have diminished and the motor car has come in to stay as a method of progression, the veterinarian has *per force* been compelled to look to the other domesticated animals for his means of livelihood, and the scientific treatment of the every day bovine diseases, so much neglected in Great Britain in the past, is now coming into its own. Schmidt, of Kolding, whose name in connection with the treatment of milk fever has become a household word, may well be held up as an example of a practitioner who did more good to the agricultural community, and to the bovine world in particular, than almost any veterinarian. Had he been of a selfish disposition he might, instead of broadcasting his discovery to the world, have died a millionaire. Through him milk fever of the dairy cow has lost its terrors, and where, in the old days, the practitioner went to see a case of this kind with unwilling steps, and a sense of dread as to what was going to happen, he nowadays takes it in hand with pleasure, knowing full well that in more than 95 per cent. of cases

(if only he has been called in within a reasonable time) his patient will recover consciousness and be looking for food within a very few hours.

The surgery of the cattle patient will never become so elegant and general as that of the dog and horse. Economic and pecuniary considerations forbid that, but where opportunities are given the veterinary practitioner *can* "make good"; the surgery even of the brain case (as evidenced by reference to a later page in the present issue) being made not only possible, but actually a routine measure; whilst such major operations as amputation of the uterus are frequently undertaken successfully by an up-to-date practitioner without the assistance of a colleague.

The cow is looked upon as a somewhat phlegmatic patient, not especially appreciative, or responsive to, the efforts made on its behalf; and for this reason the attention given scientifically to its every-day ailments has not been so universal as to that of the horse and dog. The opportunity is, however, here, and it is to be hoped that more will be done in Great Britain in the future to study scientifically (and publish the results attained) the diseases of the cattle tribe, especially of the digestive tract and the therapeutic action of medicaments upon them.

There is room for a specialised book on cattle diseases only, written by an English author who has a practical, every-day acquaintance with the difficult routine cases of cattle practice, in collaboration with a laboratory colleague whose theoretical ideas have stood the test of trial; for, since the disappearance of the horse, the other animals of the farm, especially the cattle, have received an enhanced value which has brought them well within the round of daily patients.

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## THE NECESSITY FOR AN EFFICIENT VETERINARY SERVICE TO CONTROL CATTLE DISEASES IN INDIA.

ANNUAL Government reports on the working of the Veterinary Departments of the Indian provinces, as published in our professional journals, may not be fully understood by the ordinary professional reader in this country; and their instructive value is, to a great extent, depreciated by the inability of the readers to grasp the comparative value

of the figures shown in these reports. As an example we will take the Annual Report of the Veterinary Department of the Province of Bengal, published recently, a Review of which appears on Page 232.

The Province of Bengal, in area, is about as large as the British Isles, roughly 120,000 square miles, with a cattle and human population as large and probably a great deal larger than these islands. The private veterinary practitioner, for many reasons, is practically non-existent in India, and we may take it that, for practical purposes, the veterinary staff as shown in another column in the Review of the Bengal Report (*i.e.*, 1 veterinary adviser and director, 2 assistant-directors, 8 veterinary inspectors, and 118 veterinary assistant surgeons), is the veterinary personnel available to deal with animal diseases of all kinds in Bengal. There are, it is true, one or two European private practitioners in Calcutta, but their work is mainly concerned with race-horses and dogs, and as far as the Government report is concerned, they are negligible. What do we see? One European M.R.C.V.S., who combines the duties of Veterinary Adviser to the Government with that of Head of the Department; two native (Indian-qualified) Assistant-Directors who help the Director in completing his inspections of hospitals, dispensaries, and work all over the Province; eight native (Indian-qualified) Inspectors, with definite areas (containing a certain number of Veterinary Assistant Surgeons) to inspect; and 118 Veterinary Assistant Surgeons (natives and Indian qualified), who perform the practical veterinary work in the Province. The actual available staff is probably about 100 Veterinary Assistant Surgeons, when allowance has been made for men on leave, sick, etc.; dividing the area of the province amongst these assistants leaves each man with an area of roughly 120 square miles to operate in! Is it surprising that the District Boards are curtailing funds for expenditure on temporary-immunising sera, when they see a Veterinary Assistant, unable to cope with the work provided within his area of 120 square miles, wasting serum by late administration, and in many cases, making futile attempts to check a widespread outbreak? However keen and energetic the Veterinary Assistant may be—with an area of 120 square miles, containing innumerable villages and cattle, with no roads or communications worth mentioning—it is inevitable that his attendance at outbreaks of infectious disease should be unsatisfactory to many of the local inhabitants. Furthermore, his pay (rupees fifty per month) is so small that it precludes the maintenance of any means of conveyance but a bicycle, which is not always a feasible method of progression, even in the better districts.

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The existence of cattle disease is reported to the veterinary assistant by the police of the area in his charge ; it is usually infectious disease which is reported, other kinds of disease being more or less neglected. The figures shown in the report as " Non-contagious Diseases " are, mainly made up of trivial cases of wounds, yoke-galls, etc., treated by the assistant during his travels in attempting to reach the foci of infectious disease reported.

The " Supplied with Medicines " item refers to the issue of disinfectants to a village whose cattle are suffering from some ailment such as foot and mouth disease. The assistant probably diagnoses this disease and leaves the villagers to attend to it, with instructions and the disinfectants provided ! Foot-and-mouth disease being so widespread in India, it would be a rank impossibility to attempt to check it, even by systematic slaughter !

The next item shown is " Castrations." In Bengal, with 100 veterinary assistants, only 145 castrations have been performed ! The majority of these were performed on ponies ; the castration of bovines being done by the villagers themselves by the " Torsion " or " crushing " methods ; in fact, by any way which would avoid the shedding of a drop of the sacred animal's blood ! The Hindu veterinary assistant, as a rule, strongly objects to perform this operation (or, in fact, any operation) on a bovine animal, in case he loses " caste " !

The item, " Deaths from Contagious Diseases," may be criticised kindly by saying that the figures are " approximate." With the staff available for collecting these statistics these figures could not possibly approximate to accuracy, and they are undoubtedly grossly under-estimated, for their accurate collection would entail an impossible amount of work for the would-be-conscientious man responsible.

The figures under the heading " Inoculations " may be taken as fairly accurate. Rinderpest and Hæmorrhagic Septicæmia are rampant throughout India. The method of fighting these diseases is by inoculation of anti-rinderpest and anti-hæmorrhagic septicæmia serum, both prepared from hyper-immunised animals at the laboratories in Muktesar. As the period of immunity conferred on the inoculated animal is about 8 days in the case of anti-rinderpest serum, and an unknown period in the case of the anti-hæmorrhagic-septicæmia serum, it will be obvious that, when a widespread outbreak of either of these diseases occurs, the unfortunate veterinarian

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is hopelessly handicapped in dealing with it, as he cannot get around his huge area quick enough to protect even a small proportion of the stock exposed to infection. Inoculation undoubtedly saves a great number of animals yearly, but it cannot be carried out thoroughly enough to avoid losses occurring afterwards, owing to the short period of immunity conferred. The ignorant peasant who sees his valuable bullocks attacked with the dread disease after inoculation (which may have been done only a fortnight before) naturally does not understand the reason, and the Veterinary Department gets the blame for being incompetent and their work useless. It is not to be wondered at that the Department is not receiving encouragement from the District Boards, which are composed mainly of the cultivator and petty lawyer classes, both of whom are devoid of all knowledge of veterinary science *and cannot realise its value or compare the evidence of its economic success in other countries with its failure in their own ;* this is beyond their scope. The Government of Bengal, in this report, have expressed their disapproval of the foolish policy of the District Boards ; but, it must be remembered that the Governments of to-day have only recently handed over these responsibilities to them. Before they did this, the situation, as far as the numerically insufficient veterinary staff and want of encouragement were concerned, was much the same. The growth of the department under the old regime was so slow that the new rulers find it inefficient, and they are apparently not anxious to comprehend or acknowledge and remedy the reason why.

In the report will be seen a remark on the attitude of district boards and municipalities towards the efforts of the Department to improve the breed of cattle in the Province by the maintenance of stud-bulls of approved type in different parts of the Province. Again, the number of stud-bulls maintained may appear inadequate, though, in reality, the numbers of good bulls available are sufficient for the result obtained. The lack of control over breeding operations renders futile the attempt to improve the breed of local cattle. Cattle-breeding, whether in the hands of the Agricultural Department (as it is in some provinces), or the Veterinary Department, cannot show any general improvement of the breed in a district until there is some means devised for controlling indiscriminate breeding. It is useless having good bulls in a district when there are numbers of other inferior types of bulls roaming free among the village herds ; when there is no attempt made to select suitable animals for breeding from the progeny of the good bulls ; and when there is no sterilisation of progeny not up to standard. It is useless for local bodies to expend money in the

purchase and upkeep of good bulls unless they are prepared to tackle the question of selective breeding thoroughly. The Veterinary Department of Bengal have much more to do than they are able to cope with in the sphere of animal diseases, without being responsible for improving the breed of cattle; once the cattle-owner can feel a certain amount of security from the ravages of fatal infectious diseases, he may be inclined to spend time and money in improving the type of his cattle, and thereby enhance their value. At present an insurance company would hardly accept them as a fair risk! The Bengal Veterinary Department have not the staff to tackle this cattle-breeding enterprise, and instead of carrying on with a hopeless scheme of the "stud-bull" type, they should be honest, and decline the responsibility for a scheme which they know can never show any result but failure. The fact of having a large number of stud-bulls dotted about the Province, costing a great deal for purchase and upkeep, may look well in the Annual Report under the heading "Breeding Operations," but the people who are paying for it will want to see some return for their expenditure, and it is a certain fact that the Department will get no marks for efficiency in this venture.

The Report goes on to show the activities of the Veterinary Department in the other branches of the profession within the Province, *i.e.*, teaching and research. Here, again, there is the same story of lack of staff. The Principal and the Vice-principal of the college are the only members of the Veterinary College staff holding the diploma M.R.C.V.S.; the other members of the staff are native Indians, qualified in the College by the three-years' course prescribed. The Principal, in addition to his duties at the College, is responsible for research and the administration of a Diseases of Animals Act for Calcutta! Any one of these posts, to be done thoroughly, would employ a qualified man entirely; but the Bengal Government evidently believes in working the willing horse. It will be admitted that to teach any one subject in the curriculum of the Royal College of Veterinary Surgeons, an expert in that subject is demanded, whether it be in the first or final year's course. When a man obtains the qualification M.R.C.V.S., he can claim to have some knowledge of animal diseases, but he cannot claim to be an expert teacher in every subject of the curriculum through which he has passed; although he may attain a certain proficiency in, perhaps, two or three subjects, as his teachers have done before him. In the Bengal College there are only two men qualified to teach a veterinary subject according to our standards; the other teachers or lecturers have been trained in the Bengal College under the same conditions (as to teaching staff) as the present

students are being trained. This staff is considered good enough to turn out the future veterinary staff of India in a year less than a veterinary surgeon is taught his profession in Britain by selected expert teachers! This method of production of veterinary staff may have been necessary in the early days of the profession's existence in India; but, at the present day, to turn a man out of college ill-equipped in the struggle for existence is a crime of which the veterinary profession should not be guilty. That this is going on in the Bengal College, is evidenced by the unemployed graduates, and the shortage of applicants to vacancies for students at the College. The Bengal College is an imposing and well-equipped institution; but, unless the Bengal Government move with the times by employing a full expert teaching staff, and extending the course to give the students a fair opportunity of gaining a thorough knowledge of their profession, the College may close its doors, as no sane person would send his son to spend three years at college gaining a smattering of learning which is useless as a means of livelihood afterwards. The question which occurs to one on studying these Indian Provincial Veterinary Department compilations is, *Who is responsible for this state of affairs?* Is it the Indian Veterinary Service who have failed in their duty by not pointing out mistakes to their employers?—or is it the Government under whom they work, who have enforced the carrying on of these unsatisfactory methods? The blame, one ventures to hope, will not be entirely the burden of the Veterinary Service, although its advice may not always have been infallible. The members of the Indian Veterinary Service have always been fighting an uphill battle against religious prejudice, official inertia, and ignorance, as pioneers of veterinary science in India. *It is time the profession as a whole enquired into the state of affairs in India, and gave what assistance it is capable of to rectify matters.*

An enquiry of this kind cannot, however, be undertaken either by the Council of the Royal College, or even by that of the National Veterinary Association, until the matter is officially brought before them, and it is for those of our profession who are discontented with their lot to officially represent the *pros* and *cons* of their present position before the official body, who watch over and control the affairs of the profession, before action can be taken.

They can bear in mind, too, that official and concentrated action of the Council of the Royal College is never taken without very careful consideration beforehand, and that it is only on very rare occasions that their action, when taken, has failed to attain its object.

## General Articles

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# PUERPERAL FEVER.
# A STUDY IN COMPARATIVE PATHOLOGY.

By LESLIE PUGH, B.Sc., F.R.C.V.S.,
*Sevenoaks.*

### Introduction.

On September 28th, 1895, died Louis Pasteur, whose clear and logical genius—typical of all that is best in the scientific work of France—enriched the world with a series of researches of which any one alone would have entitled him to the highest honours.

But although, through the courage and persistence of Lord Lister, his work found immediate application in the practice of medicine, there remains to-day—40 years after the completion of Pasteur's last research—one sphere in which the twin doctrines of asepsis and antisepsis have failed to control a definitely septic disease.

The student of current medical literature, whether professedly an obstetrician or not, cannot be ignorant of the fact that the incidence of puerperal fever has diminished but little since before the days of Pasteur and Lister. One explanation of this fact is common to all dissertations on the subject, namely, that doctor and nurse fail to observe sufficiently those rules of cleanliness by which alone puerperal fever can be abolished. That there is much truth in this criticism cannot be denied, although the blame probably lies as much with the existing social and economic system as with individuals. It fails, however, to explain those cases in which neither doctor nor nurse has been present and in which labour has followed a normal physiological course without interference of any kind.

Indeed, the clinical aspects of puerperal fever, the very fact that it is puerperal, stamp it as something more than a chance infection and warn us at once that not only the infecting organism, but the nidus on which it grows and the circumstances which favour its development are worthy of our consideration.

Amongst recognised methods of study is that of comparing two diseases of similar character, but occurring perhaps in different races or species and such a comparison can scarcely fail to give at least a clearer conception of the various factors at work.

It so happens that, in studying sterility in cattle, the writer has several times encountered a type of puerperal fever which seems to have important analogies with that occurring in human beings. As already stated, this essay is devoted to the consideration of these analogies although it must also be admitted that the circumstances of parturition and the anatomy of the genital tract in ruminants are responsible for certain striking variations from the clinical picture of human puerperal fever. It is also the fact that cattle seem to be more tolerant of septic infections than are human beings. These considerations might at first sight appear to invalidate the comparison to which this essay is devoted, but more detailed examination would seem to give them a different significance.

### Arrangement of Essay.

The purposes of this essay are, firstly, to compare and contrast puerperal fever in human beings with an apparently similar disease in cattle ; and, secondly, to discuss how far this comparison increases our knowledge in either case.

In order that the main lines of an argument which necessarily covers a wide field may not be obscured by detail, much that is purely explanatory and descriptive has been relegated to appendices.

The arrangement of sections is finally as follows :—

A. A Description of the Clinical Picture of the Disease in Cattle.

B. A Concise Comparison in Tabular Form of the Human and Bovine Fevers.

C. The Detailed Comparison of the Human and Bovine Fevers.

D. The Conclusion that the Disease is Substantially of the Same Nature in Human Beings and Cattle.

E. Deductions from this Conclusion :—
   (1) As to Portals of Infection and
   (2) As to the Existence of a " Puerperal Diathesis."

F. Appendices :—
   (1) Placentation in Cattle.
   (2) Cattle Infection with the *Bacillus abortus* (Bang).
   (3) Bacteriology of Retained Placenta in Cattle.
   (4) " Scours " or Infective Diarrhœa of Calves.
   (5) Description of an Outbreak of Puerperal Fever on Farm X.

A. The Clinical Picture of Bovine Puerperal Fever.

This, as would be expected, varies considerably according to the treatment adopted, the virulence of the organism responsible and the resistance of the affected animal. Nevertheless, there is sufficient likeness in all essentials to establish a definite clinical syndrome. The salient features of this syndrome are as follows :—

Up to the time of calving there is nothing to suggest the likelihood of puerperal fever. The animal appears in good health and shows no signs of any illness. The disease is generally conceded to be more frequent in heavy milkers, but it has not been possible to bring forward any statistical proof of this impression. There is no particular incidence in the first or any other pregnancy.

The first suggestion of trouble ahead may be provided by a lengthening of the period of actual parturition. This is not due to any such mechanical factor as might be provided by abnormal size of the calf, but (since the infection is already present) may with some probability be ascribed to defective contractions of the uterus. The cow " hangs about " and some five or six hours may elapse before the calf is born. But this, however, is not a constant finding, and in many cases parturition is accomplished in the normal time of half to one hour.

The placenta should normally come away within two or three hours of labour and, in the majority of cases, the first definite abnormality is its failure to do so. Those who have seen many cases ; for example, owners of heavily infected farms, will learn to appreciate the importance of another sign, *i.e.*, the presence of a characteristic discharge. This is rather thick, opaque and reddish-brown in colour. It is not offensive at first, but smells " vealy." It quickly becomes offensive. It is moderately profuse.

If the cow be now examined, it is still impossible to detect any signs of systemic infection. The temperature and pulse are normal. Feeding, defæcation and urination all proceed in the usual way. Even in an untreated case, this state of affairs may last for three or more days.

But after this preliminary period (during which there is reason to suppose that only coliform organisms are active) more serious symptoms may set in and, with varying degrees of acuteness, the picture of septicæmia develops. Appetite is lost and milk secretion fails, the expression of the animal is anxious and the temperature may rise to 102·5 to 105. The pulse quickens. There is a scanty

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vaginal discharge which is generally coffee-coloured, burning and offensive. As a rule the bowels are constipated at first but later there may appear a profuse, watery, fœtid diarrhœa which is of very grave prognostic significance.

The abdominal wall is " tensed " and rigid. Wasting quickly becomes a prominent feature, there is sinking in of the eyes and purulent discharge at the inner canthus. There is extreme nervous depression and muscular weakness follows. There is occasional straining, especially if the uterus be palpated per rectum. The extremities grow cold and death soon follows.

When the course of the disease is less acute, death may be caused by complications, such as peritonitis or pneumonia. The chief features of the clinical picture are thus :—(1) Apparent good health prior to and at parturition ; (2) Delay in expulsion of the placenta ; (3) A latent period before the onset of febrile symptoms ; (4) Septicæmia which, if untreated or treated too late, is usually fatal. To these one ought, perhaps, to add a further sign, although it cannot be fully discussed in this paper, nor is anything comparable known in human pathology. This is (5) Acute, often very rapidly fatal, diarrhœa in the calf, appearing from a few hours to several weeks after birth.

Together with these main signs certain subsidiary features should be stressed because of their value to the veterinarian, and because one can never be certain when an apparently minor point will be seen to have very great significance. These subsidiary features are :— (6) The greater incidence in the dairying breeds, *i.e.*, in heavy milkers ; (7) The occasional prolongation of the period of parturition (as pointed out by Williams, of Cornell University) ; (8) The character of the discharge immediately after parturition ; (9) Fœtid diarrhœa in advanced cases.

The above is a description of a typical case of bovine puerperal fever which is, the writer believes, comparable to the septic puerperal fever of human beings. It sometimes happens that the primary coli infection of the first three days continues without complication by any organisms more serious than saprophytes, or even continues entirely uncomplicated.

In these cases (which seem to correspond to the " putrefactive " form of human puerperal fever—*vide* Williams) constitutional symptoms are relatively slight. The discharge is profuse and fœtid, but not frothy. Extension to the adnexa is unusual except in very long standing cases and response to treatment is good.

## B. A Comparison of Bovine and Human Puerperal Fever in Tabular Form.

Before entering on the details of comparison it is necessary to refer to two considerations which should be kept in mind throughout. The first of these is the fact that the placenta in the cow is a more primitive organ than in the human being, and, in particular, is a multi-partite organ and comparatively loosely attached to the uterus. (For structures, etc., see Appendix I). It is normally separable without rupture of the maternal sinuses, whereas in the human placenta actual tearing across of these sinuses is inevitable. Nevertheless, the mode of attachment is such in cattle that infection and its resultant swelling lead almost inevitable to retention of the placenta.

The second point is that in cattle one is able to distinguish two distinct phases of the disease, namely, a primary coli infection and a secondary streptococcal invasion. If the secondary infection does not take place, the coli infection runs a fairly characteristic course apparently analogous to what Williams describes as the " putrefactive " form of the fever in women. But with secondary streptococcal infection once established, the disease in cattle forthwith becomes acute and dangerous and corresponds to Williams' " septic " form, *i.e.*, to typical " puerperal fever " as the term is usually understood. Although these two forms are not always readily distinguishable, and although both may be complicated from the bacteriological side by the presence of innumerable saprophytes or even of other pyogenic organisms, their sequence in time is distinct and detailed comparison must take due account of them.

### The Symptoms of Puerperal Fever.

| In Cattle. | In The Human Form. |
|---|---|
| 1. Normal pregnancy. | 1. Normal pregnancy. |
| 2. Normal parturition. | 2. Normal parturition not very usual, but absence of manual interference does not guarantee immunity from the fever. |
| 3. Retained placenta, owing to the swelling of the normal interlocking mechanism between fœtal and maternal parts. | 3. No normal interlocking of bovine type, and no characteristic retention. Partial retention not uncommon. |
| 4. Sub-involution from the first, with patency of uterine cavity and lack of muscular tone. | 4. Sub-involution commonly noted, but precise details of time and extent lacking. |

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| In Cattle. | In the Human Form. |
|---|---|
| 5. Coli infection at time of parturition. (The calf often dies from a form of "scours," *i.e.*, enteritis, which has been shown by Jensen and accepted by most other writers to be due to coli infection.) | 5. Pure and mixed coli infections recorded, but early intra-uterine culture results are lacking. The not infrequent coli infection of the urinary tract in pregnant and parturient women is noteworthy. |
| 6. A form of the disease in which constitutional symptoms are absent or slight and in which the retention of a putrid placenta may only be suspected from the appearance of vaginal discharge several days after parturition. | 6. Williams describes a "putrefactive" form of the disease in which symptoms are relatively slight and in which discharge is profuse and putrid. |
| 7. Recovery from this form is usual in the absence of secondary pyogenic infections. | 7. "These cases usually eventuate in recovery"—Williams.[33] |
| 8. Latent period of three to four or more days between parturition and acute onset of constitutional symptoms in the fatal form of the disease. | 8. Williams notes the acute onset of the septic form "after everything has gone smoothly for the first three or four days of the puerperium." |
| 9. In this form the discharge is not necessarily putrid, although commonly so. | 9. "May be practically devoid of odour"—Williams.[33] |
| 10. The uterus is tender, indicating acute metritis on rectal palpation. Abdominal palpation impossible. | 10. Uterus tender on abdominal palpation and also on rectal examination. |
| 11. The disease may be rapidly fatal. | 11. High mortality recognised by all. |
| 12. Spread of infection to other organs is much more usual than in the putrefactive form. | 12. The characteristic symptoms of peritonitis usually make their appearance during the first week of the puerperium. |
| 13. The earlier the retained placenta is examined, the more certainly is a pure coli infection found. | 13. Information lacking. |
| 14. Streptococcal infection usual in acute fatal type. | 14. Streptococcal in 41·8 per cent. of a series of 67 cases "which included all forms, but no fatalities"—Williams.[33] |
| 15. Endemic foci well known. | 15. Formerly endemic in hospitals. |

Above are set out in tabular form the chief features of bovine and human puerperal fever. There are, of course, many parallels in subsidiary symptoms, each of which will be found to be an ordinary result of some condition already set out in the table. It has not seemed worth while to include these, *e.g.*, the various forms of septic extension in the pelvis, in detail.

*(To be continued.)*

# A REVIEW OF SOME MODERN THEORIES OF MILK FEVER.

By WILLIAM LANCELOT LITTLE, F.R.C.V.S.,
AND
NORMAN CHARLES WRIGHT, M.A., Ph.D.
(*From the National Institute for Research in Dairying, Reading University.*)

Milk fever has in the past been a source of very serious loss to the dairy farmer. Before the present method of treatment was in practice, about 60 per cent. of the cases terminated fatally. With the advent of modern treatment (*i.e.*, inflation of the udder) first used by the Danish veterinarian Schmidt, this mortality has been reduced to 10 per cent.

The problem of the actual cause of the disease is, however, still unsolved. Many theories have been put forward, but very little definite experimental evidence has been obtained in support of any one of them. It is obvious that very valuable results might be obtained from a knowledge of the ultimate cause of the disease, for it is only when we know the factors which cause a disease that we can hope to find a means of preventing its occurrence.

It is the object of this paper to summarise our present knowledge of milk fever and to show how far the more recent theories are in harmony with the very limited experimental results which have been obtained.

## Symptoms.

The symptoms of milk fever are typical. The disease occurs usually within a few days previous to or after calving. It is characterised by an appearance of anxiety and restlessness on the part of the animal, followed by typical "paddling" of the hind feet and staggering. These symptoms gradually become more acute, until finally the animal goes "down" with its limbs fixed in tetanic spasm, either in the flexor or extensor position. The affected muscles are hard and the limbs are extremely difficult to move, though they undergo spasmodic involuntary movements. The symptoms are, in fact, typical of a condition known in medicine as "tetany." If left untreated the patient may exhibit convulsive and maniacal symptoms, which ultimately terminate in unconsciousness and death. The temperature is normal or more often subnormal.

## Occurrence.

While it is difficult to give any general indication of the factors influencing the occurrence of milk fever, there appears to be definite evidence in support of the following statements.

(*a*) Milk fever is in general localised to districts, or even to indi-

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vidual farms. (It is interesting that this fact is true also of human tetany.)

(*b*) The disease is more liable to occur in high-yielding cows and further, is usually found only between the third to the seventh calving, *i.e.*, at the period of the life of the cow when her milk yield is highest. There appears to be no direct evidence that the general condition of the cow influences the occurrence of milk fever, or that cows giving a high percentage of fat in the milk are more liable to the disease.

(*c*) The occurrence of the disease is popularly supposed to be seasonal, the general opinion being that it occurs in spring and in autumn more frequently than at other times of the year. It is difficult to make any definite statement with regard to seasonal variation, owing to the fact that the number of cows calving during each season of the year is also variable. Little (in unpublished work) has attempted to correlate the occurrence of milk fever with climatic conditions, and his figures give an indication that conditions which cause the production of a quick-growing and rank pasture favours the onset of the disease. Unfortunately the figures available are very small. It would be of considerable interest to find to what extent his facts were borne out in other districts, and by other veterinary workers.

## Theories of the Cause of Milk Fever.

(*a*) *Older Theories.*—The literature relating to the ætiology of milk fever is extensive, and it may be said of this disease that veterinary pathologists have not been behindhand in formulating theories which shall account for the symptoms.

It will suffice here to note that milk fever has in the past been attributed to such disease conditions as cerebral anæmia, cerebral hyperæmia, the formation of fat emboli, autointoxication, anaphylactic shock and mammary neurasthenia. While it may be said that all these theories lack confirmation by direct experiment, certain of them form the basis of more modern theories which are discussed below.

(*b*) *Toxin-formation Following Ketosis.*—Pugh (1924) (1) has put forward the theory that milk fever is due to the action of botulinus-like toxins following the onset of a ketosis due to faulty fat metabolism. The main arguments which he brings forward to justify this theory are (1) the general similarity of the symptoms of milk fever with those produced by organisms of the botulinus-type; and (2) the alteration in fat metabolism at parturition observed by Coope and Motham (1908) which he suggests is a predisposing cause of ketosis. In his paper he states that he has obtained results which "show that aceto-acetic acid is present in the urine of affected cows in far greater amounts than can be explained on physiological grounds."

This theory has been criticised from two points of view. Dryerr and Greig (1921), in addition to a number of other criticisms, have shown the impossibility of explaining the very rapid curative action of inflation if the symptoms of milk fever are due to toxæmia from organisms of the *B. Botulinus* type. Little and Wright (1925) (2) have carried out quantitative estimations of the acetone bodies of the blood and urine of cows and have demonstrated that there is no significant increase in these bodies in cases of milk fever, *i.e.*, that there is no ketosis. There appears therefore to be no justification for the theory that milk fever is caused by botulinus-like toxins following the onset of ketosis.

(*c*) *Derangement of the Organs of Internal Secretion.*—Our knowledge of the functions of the various organs of internal secretion, and of their inter-relationship is so scanty, and so beset with theories, that it is not surprising that derangements of these organs have been suggested as explanations for the symptoms of milk fever. Theories postulating the interaction of ovarian and mammary hormones with the thyroid, parathyroid and adrenal glands have been put forward, but are without either theoretical or experimental justification.

One extremely interesting paper which merits serious consideration has, however, been recently published. We refer to the paper by Dryerre and Greig (1925) (3). From an examination of the symptoms of milk fever they suggest that there are present two superimposed classes of phenomena : the muscular tremors and spasms which are suggestive of an increased irritability in the somatic neuro-muscular mechanism, and the disturbances in the viscera (arrestment of defæcation and micturition, loss of swallowing and coughing reflexes, etc.), which could be interpreted in the light of a hypotonus of the para-sympathetic system. These symptoms they claim to be due to a relative parathyroid deficiency, resulting in the accumulation of guanidine toxins and concurrently in a diminution in the available calcium.

On their theory inflation of the udder, by initiating powerful afferent stimuli, reflexly causes an excessive secretion of adrenaline and possibly prevents calcium loss. The adrenaline, by exerting its power of hastening oxidation, causes the destruction of the toxins, and consequent recovery.

It has long been known that extirpation of the parathyroid glands produces the symptoms of tetany enumerated above, but the direct cause of these symptoms is a point of debate. Two theories have been put forward : one states that tetany is the direct result of the reduction in the calcium content of the blood, and the other that tetany is caused by an excessive accumulation in the blood of guanidine which is normally destroyed through the action of the parathyroid hormone.

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There is ample proof that in cases of tetany the calcium content of the blood is lowered, and a similar reduction in the calcium content of the blood in cows with milk fever has been demonstrated by Little and Wright (1925) (2). The evidence for the accumulation of guanidine as a result of extirpation of the parathyroids is less convincing. The most complete work is that carried out by Noel Paton and his co-workers, who claim to have demonstrated the presence of guanidine in the urine of animals deprived of their parathyroids. They also obtained tetany by injection of guanidine into the blood stream. Greenwald (1924), (7) however, severely criticises this work, and points out that: (*a*) the methods of analysis were not beyond criticism; and (*b*) in the injection experiments, relatively enormous quantities were retained with no symptoms of tetany. His repetition of this work with more reliable methods of analysis gave negative results. Greenwald considers that only two well-defined symptoms are universally found in tetany: first, a decrease in the calcium content of the blood, and second, a diminished phosphate excretion in the urine.

Dryerre and Greig state that they are at present conducting experiments into such points in their theory as are capable of demonstrable proof. Their work should be awaited with very great interest, for their theory, while not free from difficulties, goes further towards an adequate explanation of the symptoms of milk fever than any which preceded it.

(*d*) *Calcium Deficiency.*—The investigations of Little and Wright (1925) (2) had their origin in the observation that the tetany of milk fever presented very similar clinical symptoms to those which are found in human and in experimental tetany, in which an invariable accompaniment of the tetany is a lowered calcium content of the blood. The loss of calcium during the latter period of pregnancy is considerable, and it was considered that at parturition conditions might exist in which the blood calcium content could be more easily lowered. In an investigation of twelve cases they found that the cows when " down " with milk fever showed an average fall of 50 per cent. in the calcium content of the blood. Further, the fall in the calcium content always ran parallel with the severity of the symptoms. While these facts lend support to the theory of relative parathyroid deficiency, the authors tend towards the opinion that the explanation may be more simple. There are a number of obvious factors which may contribute to the lowered calcium content of the blood.

The animals may have an actual deficiency of lime in their rations, or by confinement in stalls during the winter they may be denied of sunlight and of adequate fresh green (vitamin containing) foods, which are necessary for the proper assimilation of lime. The fact that on

one farm four normal animals, when blood was examined, all showed low calcium values, lends support to the suggestion that inadequate nutrition may play an important part in the disease. Moreover, apart from any possible deficiency of lime in the rations, or of defective assimilation, it must be borne in mind that the cow suffers very considerable loss of lime during pregnancy and at the commencement of lactation. The sudden loss of lime at the commencement of lactation is particularly striking, and because of its coincidence with the period of onset of milk fever, it is of particular importance to consider it in further detail.

If, as an example, we take a cow weighing 12 cwt. and giving at the commencement of lactation one gallon of colostrum, and we calculate the lime content of the blood and colostrum, we obtain the following result :—

| | | | |
|---|---|---|---|
| Weight of blood in cow | 100 lb. | Weight of Colostrum | 10 lb. |
| Percentage of lime in blood .. .. | 0·01% | Lime in Colostrum .. | 0·20% |
| Weight of lime in total volume of blood .. | 0·01 lb. | Weight of lime in gallon Colostrum.. | 0·02 lb. |

That is to say, the secretion of half-a-gallon of colostrum would be sufficient to deplete the blood of the whole of its lime, supposing there was no reserve store of lime in the body from which the blood might replenish its lime content.

These figures illustrate sufficiently well the possible part played by the first flow of milk in lowering the lime content of the blood, and hence in bringing about the onset of milk fever. And it is particularly interesting to find that the only successful method of treatment, *i.e.*, inflation of the udder with solutions or gases, is just the treatment which would tend to prevent milk secretion from taking place, and would therefore tide the animal over the period of sudden loss of lime. How far such a simple explanation of calcium deficiency will account for the lowered calcium content of the blood in milk fever cannot at present be stated, but such an explanation is given additional value when the factors influencing the occurrence of the disease are taken into account.

(*e*) *Lowering of Blood Sugar.*—Maguire (1926) (4) published a theory in which he endeavoured to show that milk fever is due to a hypoglycæmia probably brought about by the enormous strain on the thyroids, suprarenals and pituitary bodies, especially the latter two and claimed to have treated cases successfully by glucose injections. To support his theory he published blood sugar determinations of two cases showing before treatment 0·04 and 0·05 per cent. sugar content which rose with treatment to 0·09 per cent. and 0·12 per cent.

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The work of Widmark and Carleus (1925) (5) on " Hyperglycæmia due to inflation of the udder of animals in milk by air," lends support to this theory. They showed that : The inflation of the udder of lactating cow caused a hyperglycæmia of short duration. In heavy milking animals this was more marked than in those giving a smaller quantity of milk, and they suggested that the favourable action of the inflation of the udder in parturient paresis was to be attributed to the increase in the glucose content of the blood. Unfortunately they did not extend their investigation to cases of milk fever. Blood sugar determinations have been made by Little and Keith (unpublished) on five cases, with the following results :—

| | Animals Comatose. | Animals Recovered. |
|---|---|---|
| (1) .. | 0·08% sugar .. | 0·07% sugar |
| (2) .. | 0·09% ,, .. | 0·07% ,, |
| (3) .. | 0·075% ,, .. | 0·07% ,, |
| (4) .. | 0·116% ,, .. | (died) |
| (5) .. | 0·105% ,, .. | — |

This preliminary work is not sufficient to formulate any opinion, but it is rather surprising to find such high figures when the animals were comatose ; all blood samples were taken before inflation of the udders. This seems to show that in milk fever there is, if anything, a hyperglycæmia. It is hoped that it will be possible to continue this investigation.

(*f*) *Anaphylactic Shock Following Re-absorption of Lactalbumen.*—Hynd (1925) (6) has investigated the nature of the urinary protein in cases of eclampsia and has been able, by means of measurements of the optical rotations of the proteins, to demonstrate the presence of lactalbumen. Lactalbumen must, from the work of Woodman (1921) (8) be considered a foreign protein when present in the blood stream.

Hynd writes, " Possibly it may be that small amounts of lactalbumen may find their way into the blood stream during lactation but that, as a rule, immunity to this foreign protein is established. When this immunity is not established, or when a sudden release of a large amount of lactalbumen occurs, corresponding to a ' shock ' dose of foreign protein, then eclampsia is the result." An investigation into milk fever on lines similar to those adopted by Hynd might yield interesting and suggestive results.

### Experimental Treatment.

(1) *Inflation of the Udder.*—It is suggested that the benefit derived from this method of treatment may be due to the cessation of milk secretion caused either by direct pressure (inflation of gases) or by osmotic pressure (inflation of liquids).

(2) *Calcium Injections.*—Benefit has been derived from both intravenous and intra muscular injections of calcium chloride in 10 per cent. solution, 30 to 40 cc. being injected and repeated if required in six to eight hours. When possible calcium lactate can be given orally in doses of 40 grains every three hours with benefit.

It is an advantage to inflate the udder in conjunction with the above treatment.

(3) *Injection of Glucose.*—This method of treatment and the subcutaneous injection of oxygen to increase the blood sugar have been recommended by L. C. Maguire (4).

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## THE SUBCUTANEOUS TUBERCULIN TEST. A RETEST AFTER A SHORT INTERVAL.

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IT is well known that a subcutaneous injection of tuberculin shortly before the use of an ordinary test dose prevents a typical tuberculin reaction in the majority of tuberculous cattle. That if double the usual test dose be used under such circumstances a temperature reaction usually, if not always, follows does not appear to be so widely known and on few occasions does this knowledge appear to be applied. There are many circumstances under which one would wish to test cattle which have been, or may have been, recently subcutaneously injected with a test dose.

Since 1920 the cattle on the farm attached to the Department of Agriculture of this college have been periodically tested by the subcutaneous method, with a view to the eventual establishment of a herd free from tuberculosis. The difficulty of removing all reactors from this pedigree herd was met by isolating, as well as possible, those of particular breeding value and disposal of the others. So successful had these efforts been that it became economically possible after the spring test of 1924 to dispose of all animals which had reacted to the test.

A study of the history of each cow was then made and some degree of doubt, as to the correct interpretation of the temperatures recorded,

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existed in certain cases. It was considered advisable to retest all "doubtful" animals immediately. Since all had been tested within the previous two weeks the "double test-dose" method was employed.

Seven cows having definite histories, five reactors and two non-reactors, were included in the special test. In this article the history of each of these seven animals is given, and the observations made during the conduct of the double-dose test are recorded.

Table I details their previous tests, and it will be observed that six of the cows were tested on the 6th of May, 1921, and the exception, No. N.R. 1, seven days before that date. The record of each of these animals is sufficient to place them in a definite category; the first five "reactors," the latter two "non-reactors."

Two pre-injection temperatures having been taken, double the usual dose of tuberculin was injected at 5 p.m. on the 13th of May. Post-injection temperatures were taken at hourly intervals thereafter until the thirteenth had been recorded. The final observation was made at the fourteenth hour. The temperatures were, therefore, taken during the evening, night and early morning. It has been the practice, when testing this herd, to time the injection that the determining temperatures be taken during the evening and night. It has been found, in the herd under consideration, that less disturbance of temperature from external influences occurs at these times. This aids in obtaining clear-cut results.

Table II details the observations made during the conduct of the "special" test. The five cows believed to be tuberculous reacted to the test. The two non-reactors showed no elevation in temperature.

Table III gives the average temperature of (*a*) the five reactors, and (*b*) the two non-reactors.

For the purpose of comparison it is convenient to designate temperatures higher than the average before injection by more than 1·5° F. as "reaction temperatures." Reaction temperatures were present in each animal as follows:—

| | |
|---|---|
| R. 1 .. .. .. .. | at and between the 6th and 14th hour. |
| R. 2 .. .. .. .. | ,, ,, ,, 4th ,, 14th ,, |
| R. 3 .. .. .. .. | ,, ,, ,, 2nd ,, 5th ,, |
| R. 4 .. .. .. .. | ,, ,, ,, 2nd ,, 7th ,, |
| R. 5 .. .. .. .. | ,, ,, ,, 4th ,, 9th ,, |
| N.R. 1 .. .. .. | at no time. |
| N.R. 2 .. .. .. | ,, ,, |

The average temperatures of the five known reactors show reaction temperatures at and between the third and the eighth hour after inoculation. The average of the two non-reactors during the whole period was at no time higher than their average pre-injection temperature.

TABLE I.
*History of Subjects.*

| Cow No. | Date of Test. | Temperature (° F.). | | | | | | Interpretation. |
|---|---|---|---|---|---|---|---|---|
| | | Average before Inoculation. | Hours after Inoculation. | | | | | |
| | | | 6 | 9 | 12 | 15 | 18 | |
| R. 1 | 18/1/23 | 102·0 | — | 101·0 | 101·0 | 100·4 | 100·8 | No reaction. |
| | 16/11/23 | 101·0 | — | 101·6 | 103·0 | 106·0 | 105·4 | Reaction. |
| | 6/5/24 | 101·0 | 101·8 | 101·8 | 104·0 | 104·4 | 103·2 | Reaction. |
| R. 2 | 4/1/22 | 101·2 | — | 105·0 | 105·6 | — | — | Reaction. |
| | 4/5/22 | 100·6 | — | 104·2 | 105·2 | 106·0 | 105·6 | Reaction. |
| | 1/12/22 | 100·4 | — | 104·4 | 106·0 | — | — | Reaction. |
| | 16/11/23 | 100·0 | — | 106·8 | 106·0 | 105·2 | 105·4 | Reaction. |
| | 6/5/24 | 101·2 | 102·0 | 103·8 | 106·4 | 103·5 | 104·0 | Reaction. |
| R. 3 | 18/1/23 | 101·0 | — | 103·0 | 105·0 | 106·6 | 106·0 | Reaction. |
| | 16/11/23 | 101·4 | — | 103·0 | 104·8 | 105·0 | 104·8 | Reaction. |
| | 6/5/24 | 101·4 | 103·8 | 102·0 | 101·6 | 102·5 | 103·8 | Reaction. |
| R. 4 | 4/1/22 | 101·2 | — | 101·2 | 101·0 | 101·4 | 105·0 | Reaction. |
| | 18/1/23 | 101·4 | — | 102·0 | 103·4 | 105·0 | 104·0 | Reaction. |
| | 6/5/24 | 101·6 | 103·8 | 104·4 | 104·0 | 104·2 | 102·6 | Reaction. |
| R. 5 | 18/1/23 | 102·0 | — | 104·0 | 105·0 | 105·0 | 102·4 | Reaction. |
| | 16/11/23 | 102·0 | — | 105·8 | 106·0 | 104·4 | 105·0 | Reaction. |
| | 6/5/24 | 102·0 | 103·4 | 105·6 | 106·0 | 103·8 | 102·6 | Reaction. |
| N.R. 1 | 22/3/21 | 101·0 | — | 101·6 | 100·6 | 101·0 | 101·0 | No reaction. |
| | 30/11/21 | 101·0 | — | 101·4 | 101·0 | 101·0 | 101·0 | No reaction. |
| | 4/5/22 | 101·2 | — | 101·0 | 101·8 | 101·2 | 101·0 | No reaction. |
| | 4/1/23 | 101·0 | — | 101·0 | 101·0 | 101·0 | 101·0 | No reaction. |
| | 29/4/24 | 101·0 | 100·6 | 101·0 | 101·0 | 101·4 | 101·4 | No reaction. |
| N.R. 2 | 4/5/23 | 101·4 | — | 102·0 | 101·6 | 101·0 | 101·0 | No reaction. |
| | 18/1/23 | 101·0 | — | 102·0 | 101·0 | 101·6 | 101·0 | No reaction. |
| | 16/11/23 | 101·2 | — | 101·4 | 101·0 | 100·8 | 100·6 | No reaction. |
| | 6/5/24 | 101·4 | 101·4 | 100·8 | 100·8 | 100·8 | 101·6 | No reaction. |

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TABLE II.

*"Double-Dose" Test*, 13/5/24.

| Cow No. | Temperatures (° F.). | | | | | | | | | | | | | | Interpretation. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average before Inoculation. | Hours after Inoculation. | | | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 14 | |
| R. 1 .. | 101·6 | 101·4 | 101·4 | 102·0 | 102·8 | 103·0 | 104·2 | 104·2 | 104·0 | 103·8 | 103·6 | 103·4 | 103·4 | 103·6 | Reaction. |
| R. 2 .. | 101·8 | 102·6 | 102·6 | 103·2 | 103·8 | 104·6 | 105·0 | 105·0 | 104·8 | 104·6 | 104·8 | 103·8 | 103·4 | 103·4 | Reaction. |
| R. 3 .. | 101·8 | 103·2 | 103·6 | 104·0 | 105·2 | 105·0 | 102·4 | 103·0 | 102·4 | 101·4 | 101·2 | 101·0 | 101·0 | 100·6 | Reaction. |
| R. 4 .. | 101·8 | 102·2 | 104·2 | 105·2 | 105·4 | 105·0 | 104·0 | 104·0 | 103·0 | 102·8 | 102·6 | 102·4 | 102·0 | 101·8 | Reaction. |
| R. 5 .. | 102·0 | 102·4 | 102·8 | 103·0 | 104·0 | 105·6 | 105·2 | 105·2 | 104·8 | 103·8 | 103·0 | 102·4 | 102·4 | 102·4 | Reaction. |
| N.R.1 .. | 101·2 | 101·0 | 101·6 | 100·8 | 100·4 | 100·2 | 100·4 | 100·4 | 100·0 | 100·4 | 101·0 | 101·0 | 100·6 | 100·8 | No reaction. |
| N.R.2 .. | 102·0 | 102·2 | 101·6 | 101·6 | 101·6 | 101·6 | 101·4 | 101·2 | 101·6 | 101·4 | 101·4 | 101·4 | 101·2 | 102·0 | No reaction. |

TABLE III.

*Average Temperatures from Table II.*

| Group. | Temperature (° F.). | | | | | | |
|---|---|---|---|---|---|---|---|
| | Average before Inoculation. | Hours after Inoculation. | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Reactors (5) .. | 101·8 | 102·3 | 102·9 | 103·5 | 104·2 | 104·6 | 104·2 |
| Non-Reactors (2) | 101·6 | 101·6 | 101·6 | 101·2 | 101·0 | 100·9 | 100·9 |

| *Continued.*— Group | Temperature (° F.). | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Average before Inoculation. | Hours after Inoculation. | | | | | | |
| | | 7 | 8 | 9 | 10 | 11 | 12 | 14 |
| Reactors (5) .. | 101·8 | 104·3 | 103·8 | 103·3 | 103·0 | 102·6 | 102· | 4102·3 |
| Non-reactors (2) | 101·6 | 100·8 | 100·8 | 100·9 | 101·2 | 101·2 | 100· | 9101·4 |

SUMMARY.—Five known reactors to the tuberculin test were submitted to a "special" test, double the usual dose of tuberculin being injected, one week after the conduct of an ordinary subcutaneous test. Each of these cows reacted to this second test. Reaction temperatures were recorded within a few hours (maximum, six hours) of inoculation and, with two exceptions had passed before the fourteenth hour.

Two known non-reactors gave no reaction following the injection of a double dose under similar circumstances.

COMMENT.—This "special" test appears to be of particular value in the early determination of the category into which animals that have given an indefinite reaction to the subcutaneous tuberculin test fall. In the instance mentioned in this report it was certainly a great help in deciding the correct action in certain cases.

Reaction to the injection of double the usual test dose of tuberculin may commence at the second hour and, in conducting such a " special " test, it appears advisable to record the post-inoculation temperature at that time and at two-hourly intervals thereafter.

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## THE PREVENTION OF TUBERCULOSIS IN CATTLE.

By NATHAN RAW, C.M.G., M.D.
*London.*

In the Veterinary Journal of August, 1921, I published a Preliminary Note of my researches into the question of immunity to tuberculosis in animals and man.

Since that time the work has been continued, and a further series of experiments on a large number of animals at the Lister Institute, has shown conclusively that animals can be protected by means of an immunising vaccine, against a virulent dose of tubercle bacilli.

It is evident that the only way to get tubercle-free herds is by using every means to *prevent* infection, and it cannot be too strongly emphasised that calves are usually born healthy and quite free from tuberculosis, and that all of them are infected by contact in the stalls, or by drinking tuberculous milk. This infection generally takes place in the first six months.

The problem of tuberculosis in cattle is one of vast importance, not only to the stock-breeder, but to the community.

It is recognised by veterinarians that at least a million dairy cows in Great Britain are at present affected with tuberculosis, and that about five per cent. are affected in the udder, thus rendering their milk dangerous to children.

A large amount of tuberculosis—chiefly glands, bones and joints—in young persons and children is directly caused by drinking milk from dairy cows affected in the udder, whilst the annual loss to the owner of tuberculous cattle is enormous, amounting to millions of pounds.

For these reasons it is absolutely incumbent on all of us to do all in our power to eradicate the disease from dairy cows, if we are to prevent a never-ending supply of tuberculosis from animals to man.

The bovine bacillus is easily conveyable to man through milk, butter, cheese, contaminated meat and in other ways, and is the cause of a great amount of suffering and death amongst children. Many thousands die each year and many more are permanently crippled. *Prevention is better than cure*, and, if we aim at the extinction of tuberculosis in cattle, we can only succeed if we are able to prevent infection of the calf as soon as possible after birth.

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My vaccine is prepared from dead cultures of the human bacillus, which have been subcultured for 18 years in my laboratory. These cultures have entirely lost their virulence and toxicity, and will not produce tuberculosis in animals. In other words, the cultures are so attenuated as to be non-pathogenic and non-tuberculogenic. Up to the present time the vaccine has only been used in pedigree calves, for the reason that records and observations can be more accurately kept by veterinary surgeons. Over 700 calves have been protected, and the results are excellent.

METHOD OF INOCULATION.

For the purpose of protecting calves, they should be separated from the mother at birth, and fed on healthy milk for a week, when the first dose of the vaccine is given, followed in another week by the second dose of vaccine. The vaccine* is given hypodermically, under the abdomen in the usual way, with strict antiseptic precautions.

The calf can then mix with the other cattle in the herd, and is thus rendered immune to ordinary infection.

I am greatly indebted to Mr. Arthur Payne, F.R.C.V.S., of Weybridge, for his careful observations and his appended report on a number of calves.

REPORT BY MR. ARTHUR PAYNE, F.R.C.V.S. on a Herd treated with Tubercle Immunizing Vaccine R.

A PRELIMINARY note and history, etc., of each animal treated dating from February, 1923, when the vaccine was first used can be seen in the VETERINARY JOURNAL, December, 1924.

The animals mentioned were tested with tuberculin (hypodermic and ophthalmic) in April, 1925, and October, 1925. The temperatures were taken twice before inoculation, at injection, and at the 9th, 12th and 15th hours after.

The tests proved negative each time, and there were no doubtful cases.

The animals mentioned as in the previous report are as follows :—

Hilda, Emblem, Query, Louie Dona Lass, Nadejda (died at parturition), Queen Eleanor, Hettie, Flower 4th, Governess, Bissette, Obed (sold), Fern, Gracey 2nd, Barbara, Margaret's Lad (sold), Cora, Pamela, Maddy 2nd, Girlie, Celia, Dona Lass 2nd, Vallon Butt (sold).

I am still treating all the calves born on this farm with the immunizing Vaccine R. Twelve were born during 1924. These were tested in October, 1925, with negative results in every case. Twelve were born during 1925.

It is generally acknowledged that tuberculosis is spread by material

* The vaccine is prepared and standardized by Allen & Hanbury, Vere Street, London.

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from diseased animals which has become disintegrated and mixed with dust, etc., in cowsheds.

As pointed out in my preliminary report, this farm, in 1921, showed fifty per cent. of re-actors, and in 1923 a percentage of fifteen re-actors. We appear, now, to have eliminated tuberculous disease from the herd on this farm, but there must be the probability of the animals ingesting or inhaling tubercle bacilli as the same cow sheds and boxes are used. The resistance which is proved to have been established is, in my opinion, conferred by the use of the immunizing Vaccine R.

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## PREVENTION OF TUBERCULOSIS IN CATTLE BY MEANS OF VACCINATION.

By Lt.-Col. T. D. YOUNG, O.B.E., F.R.C.V.S., D.V.S.M.
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Inoculation as a means of preventing tuberculosis in cattle has long been a method under consideration, and during the last few years it has received very considerable attention.

In this country Dr. Nathan Raw has for some years been at work on the subject, and in the pages of the *Veterinary Journal* for the year 1925 there appeared an article by him giving some preliminary details. Doubtless further information will be published as to the results of vaccinating calves by his method. Time has to pass ere those animals are fattened and sent to the butcher, and a careful *post-mortem* examination made.

* In France Calmette and Guérin—a doctor of medicine and a veterinarian respectively—have for many years been working on the production of an active *living* tubercle bacillus which, inoculated into the living subject, produces antibodies, and it is hoped, also an immunity against tuberculosis without causing the dreaded disease.

Calmette and Guérin's bacilli, named B.C.G. (bacilli Calmette-Guérin), is produced from an original bovine stock of virulent character by record and termed "Lait de nocard." It was transplanted for the first time on potato cooked in oxbile with the addition of 5 per cent. of glycerine, on January 8th, 1908, and it has been re-sown since then about every fifteen days (now about every 25 days) on the same medium. After four years cultivation the bacilli were no longer virulent for cattle, but were still virulent for horses. After 13 years' successive cultivation (230th passage), in January, 1921, it was considered that they were completely deprived of their virulence, as proved by giving large doses to all species of animals. They had become incapable of causing the formation of tubercles when introduced into the living subject by intravensous, intraperitoneal or subcutaneous

* Annales de l'Institut Pasteur, Fevrier, 1926

injections, and even by ingestion. When resown on ordinary glycerinated potato the bacilli retained the same properties and did not again become virulent ; thus an avirulent type of bovine tubercle bacilli had been produced. The bacilli are stated to be absolutely harmless for all species of animals including the chimpanzee, and also man, even when introduced intravenously in large doses (1 milligramme). Animals intravenously vaccinated cease to react to the tuberculine test. They remain tolerant *up to* 18 *months* to a virulent intravenous injection and resist a prolonged cohabitation with tuberculous animals.

TESTS MADE WITH BOVINES.

This immunity could apparently be continued by renewing subcutaneous injections of the avirulent bacilli every year. Experiences quoted show that a subcutaneous inoculation into the dewlap of 2·5 milligrammes of the vaccine does not set up any local reaction, and does not confer any appreciable resistance, but a dose of 50 to 100 milligrammes causes a local reaction without any tendency to suppuration which disappears generally without leaving any traces, and the inoculations remain harmless.

Experiments are quoted as having been made with 20 heifer calves seven to eight months old ; twelve were vaccinated and eight kept as controls. Six of them received subcutaneously in the dewlap 100 milligrammes of B.C.G. diluted in 10 c.c. physiological solution ; the other six received 50 milligrammes.

The local reaction was similar in all of them ; a soft œdematous mass the size of a nut up to the size of a hen's egg, which gradually reduced to normal without any suppuration. In only three of the animals was there produced from the 15th to the 18th day a hyperthæmia (38·6 to 40·5c.) with dullness and anorexia, which existed for five to six days, due no doubt, to a temporary septicæmia.

The vaccinated animals reacted to the intradermal test, while the local lesion existed, and the reaction only ceased from the sixth month in two out of seven. At twelve months one only reacted.

The proof, as to the value of the vaccination, was made in all the animals by an injection into the jugular vein of 5 milligrammes of virulent bovine bacilli, of which 1/250th of a milligramme kills a guinea-pig in 90 days by subcutaneous inoculation.

In the controls this inoculation caused a hyperthæmia after 13 to 15 days. At the same time, their general state was altered. Cough was frequent, respiration accelerated, death by massing granulations of the lungs took place from the 30th to the 45th days. In those animals which had been vaccinated the proof test inoculation was always followed by an immediate and violent reaction (40·5° to

41° C.), but generally their condition was normal in about 24 hours, and at no time afterwards was their health affected.

It therefore appears that the " Bilié " bacilli (so called because of the use of oxbile in the medium), or B.C.G., are capable of conferring in young cattle a manifest resistance to the most severe method of experimental infection, and at the same time are harmless to the subject vaccinated, even in very large doses.

Can this method be employed as a prophylactic against tuberculosis ? In most methods difficulties are encountered. In this one the means to be adopted are difficult to apply to adults. It would, therefore, appear necessary to begin with all calves, and it is on those lines that Calmette and Guérin recommend experiments to be conducted. They advise that " All calves be inoculated within two weeks after being born, by means of a subcutaneous injection into the dewlap a large dose (50 to 100 milligrammes) of our bacilli, modified by a long series of cultures on potato which has been prepared by cooking in oxbile and 5 per cent. glycerine (bacilli B.C.G.), so that they can withstand an injection of virulent bacilli, even when injected into their veins, up to 15 months after vaccination, even when the dose of living virulent bovine bacilli is capable of killing by acute granulations controls of the same age in less than two months. The young calves which have been vaccinated give a positive reaction to tuberculin during the time that their immunity is being established. Some months later they cease to react, and the immunity tends to disappear. Thus a time arrives when they are in the same condition as animals which have not been vaccinated. Calmette and Guérin state that they will be pleased to advise any person interested in this method of vaccination.* It would be interesting to ascertain if possible what effect this vaccination would have on calves born with lesions of tuberculosis, of which there are more than are recorded.

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## TUBERCULOSIS ORDER OF 1925. ADMINISTRATION IN SURREY.

By ALFRED C. WILD, M.R.C.V.S.

*(Chief Veterinary Inspector, Surrey County Council), Woking.*

THE county is divided into eight Administrative Districts, two of which are partly in the Metropolitan Area.

The staff consists of eight Local Veterinary Surgeons, one to each of the eight districts, and a Chief Veterinary Inspector, who is a part-time official.

* Letters should be addressed to the Pasteur Institut, Laboratoire de Serotherapie, **22,** Rue Dutôt, Paris XVe.

METHOD OF PROCEDURE—NOTIFICATION.

The owner notifies the police or the Local Veterinary Inspector of his district.

The police or veterinary inspector notify headquarters, viz., the Agricultural Committee of the Surrey County Council. They, in their turn, notify the Chief Veterinary Inspector and also the Local Veterinary Inspector.

The Local Veterinary Inspector makes his diagnosis, and in so doing is given a perfectly free hand as to what means he shall take to arrive at his diagnosis. He can apply the tuberculin test in any way he thinks proper. He can send milk samples to the Lister Institute if he things fit to do so, etc.

Having made his diagnosis he serves order to slaughter, and sends his report on to the Chief Veterinary Inspector, or if he is in doubt as to whether the animal comes under the Order before giving notice to slaughter he consults with his chief.

The Chief Veterinary Inspector does the valuation, also the *post-mortems*. The *post-mortems* are usually done at the horse slaughterers', but are done on the premises if the owner wishes.

The Local Veterinary Inspector gives instruction.

The Local Veterinary Inspector instructs as to what disinfection of premises he thinks necessary, gives the owner a reasonable time, and calls to see that disinfection has been properly carried out.

Since the Order has been in force about 150 cases have been dealt with.

Dispute as to valuation has occurred in one case only.

In about two per cent. of diagnosis of tuberculosis, lesions could not be found.

The greatest valuation was one of £20. This was a case of tubercular disease of the udder.

About four per cent. of cases were found to have tubercular lesions in the udder.

When the Order first came into force several cases of chronic cough were dealt with where emaciation was not marked.

The Ministry of Agriculture gave a more definite opinion as to what they considered "chronic cough with clinical evidence" was intended to mean. Since then we have rejected several animals as not at the time coming under the Order. It is, however, interesting to notice that in about a couple of months these animals have been again reported, and this time were found to come under the Order.

This is not satisfactory, but it is the fault of the Order and not of the administration.

XUM

Our administration of the Order is perhaps somewhat expensive, but I think it is effectual. The veterinary staff are satisfied with their fees.

The Chief Veterinary Inspector attends all meetings of the Surrey Agricultural Committee dealing with diseases of animals, and since I have had the honour of being Chief Veterinary Inspector the relationship between the Veterinary Inspectors and the Agricultural Committee have been all that could be wished.

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## A CASE OF FASCIOLIASIS IN CATTLE. WITH A NOTE ON THE OCCURRENCE OF THE LARVA OF LINGUATULA SERRATA.

By NORMAN BISSETT, F.R.C.V.S.,
*The University of North Wales, Cardiff.*

ALTHOUGH it is well-known that cattle are liable to liver fluke infestation, it is from all accounts somewhat uncommon for the parasites to produce fatal results or even to cause markedly deleterious effects on these hosts. It is, moreover, rather difficult to find in the literature on the subject a detailed description of any one particular case.

The following case of Fascioliasis in a bovine host may therefore be of interest, particularly as the cow in question was acting as the intermediate host of the degenerate arachnid parasite, *Linguatula serrata* of the dog. The case was investigated in January of this year.

The host of both parasites, namely the adult *F. hepatica* and the larval form of *Linguatula serrata*, was a three-year-old cow which had spent all its life on a farm in Monmouthshire. On this farm sheep had been severely infested with liver fluke during the past year, but the owner had never before experienced the condition in his cattle, nor had the presence of flukes in the livers been reported to him by butchers.

According to his description the cow became affected with diarrhœa about four weeks previous to the date on which she was seen by the writer, viz., January 18th, 1926. Treatment had been unavailing. From the time of the commencement of the diarrhœa the animal progressively emaciated, and on the above date she was very wasted and showed marked submaxillary œdema, the latter condition having first manifested itself a week before. The œdema extended from the region just posterior to the mandibular symphysis as far as the posterior border of the larynx, but was not present in any other part of the body.

A sample of freshly-passed fæces was examined microscopically. They were very liquid, but not bloodstained. In the sample eggs of *Fasciola hepatica* were found, in the average proportion of one egg in every two smears. It must be noted that these smears were made

direct from the fæces, without washing or sedimentation. After these processes, the bottom of the eight-inch diameter petri dish in which sedimentation was carried out, was quite covered with the eggs.

A rectal scraping was examined for the bacillus of Johne's disease with negative results. This was done as a routine procedure, and also because there had previously been several cases of this disease on the premises, in one of which the period between the appearance of perfect health and death, was about a fortnight only.

The animal was slaughtered on January 20th.

POST-MORTEM.

There was no enteritis and the liver was the only organ which presented an abnormal appearance. It was enlarged and the surface of the left lobe showed three scar-like marks each about half-inch in length, round which the liver tissue was contracted exactly as though the marks were old wounds. An area in the right lobe about the size of the palm of the hand and extending inwards from the edge of the lobe, was pale pink and semi-necrotic in appearance. On the surface of this area were small hæmorrhages. The main bile ducts were greatly thickened and enlarged, dead white in colour and projecting considerably from the surface of the liver. They felt hard and solid.

As the chief object of the *post-mortem* examination was to find out the extent of the ravages of *F. hepatica*, the liver was the only organ removed for particular examination. The weight was found to be 25 lbs., or more than twice the normal. The bile ducts—from the large main ones in which the finger could be inserted, down to those measuring barely $\frac{1}{16}$ in. in diameter—were completely lined by yellow calcareous material forming a veritable skeleton, and giving one the impression that, if all the liver tissue proper were removed, the bile duct system might have stood up by itself. These hard tubular linings were firmly adherent to the walls of the ducts. The main ducts were packed with flukes, and the parasites were also found in all ducts down to those $\frac{1}{8}$ in. in diameter. In the latter the length of the flukes was about $\frac{3}{8}$ in. The average length of the parasites (which were the all too common *F. hepatica*) was 1 in., although some measured $1\frac{1}{2}$ in. Besides flukes, the ducts contained numerous loose black or very dark brown calcareous particles, which appeared to have scaled off the rough lining. Parasites and particles were bathed in thick dark brown viscous bile. In some parts of the smaller ducts masses of dark brown granular-looking material, like bile in process of inspissation, were found. Microscopic examination showed these masses to consist of innumerable fluke eggs. The gall bladder contained numerous eggs but no flukes.

Generally the hepatic parenchyma was hard, the interlobular connective tissue being increased and thickened, but in the semi-necrotic area already referred to, the liver tissue was found to be very much destroyed by what were apparently tracks of the parasites. No flukes, however, were found outside the bile ducts themselves.

In spite of the calcareous condition of the ducts, the packed state of the main ones with flukes, and the destruction of the liver tissue by the apparent wanderings of the parasites—in short all the evidences of chronic infestation—only 281 flukes were removed from the organ, but it does not follow from this that the number of the parasites was not at one time considerably greater, or that the animal had not suffered from a series of infestations.

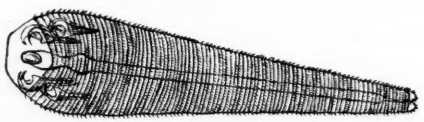
The condition of submaxillary œdema is noteworthy as it would appear to be comparatively rare in cattle (*vide* Hutyra and Marek).

Apart from this particular case, it has been the experience of the writer that calcareous deposits in the sclerotic bile-ducts in cases of liver fluke disease in cattle are more frequently found than in similar cases in sheep.

### The Larva of Linguatula serrata.

Two fully developed larvæ of *Linguatula serrata* were found in one of the hepatic lymph glands. They were contained in a cavity about $\frac{1}{4}$ in. in diameter in the centre of the gland, and were surrounded by brownish coloured fluid. No further specimens were found in spite of careful examination, but it is probable that more could have been discovered had it been possible to convey all the internal organs to the laboratory. As before mentioned, the rest of the organs appeared normal, and certainly no parasites appeared to be adherent to the external surface of the lungs—but an examination "in the field" is always unsatisfactory.

One of these larvæ was added to the writer's collection. The other was examined in some detail. It is not proposed to give a complete description of the anatomical structure, but the following notes will, it is hoped, be found sufficiently complete to enable one to recognise the parasites with some degree of accuracy.



Legend. Mature Larva of Linguatula serrata (orig).
(Enlarged 10 times and sketched from the actual specimen described in the text.)

The larva examined measured 6 mm. in length, was yellowish-white in colour, and not unlike a minute fluke in shape, *i.e.*, broad at the anterior end and tapering to the posterior. The width at the anterior end was 1 mm. The larva was mounted in lacto-phenol and examined microscopically, when the following observations were recorded.

The anterior end is blunt. The body consists of 92 annulations, although 90 is the maximum number one has found recorded. The posterior border of each annulation is furnished with curved backwardly projecting spines so that the whole body presents a formidably spinose appearance. The posterior end is notched, the edges of the notch being also furnished with spines. The blunt anterior portion is, however, spineless, and in the centre of the ventral surface of this area an elliptical opening surrounded by a hard edge can be seen. This is the mouth and from it the digestive tube leads to the anus. The tube is quite straight, with the exception of a distention immediately posterior to the mouth and a more defined and globular distention a little further down. Just anterior to the anus the tube narrows.

On each side of the mouth are two remarkably strong hooks with long and stout shafts which are embedded in the body of the larva—the curved hooks alone protruding from their respective sockets. The shafts of the hooks are curved in a dorso-ventral direction—the curvature being distinctly visible from the dorsal aspect of the larva. Each shaft with its hook appears to be encased in a membranous sheath which is continued over the hook itself like a pointed hood or like the spathe of a flower. In this instance the above arrangement at first glance gave the misleading impression of a double hook at the end of the shaft—although accessory or double hooks have been reported in the literature on the parasites.

It is particularly interesting to note that no dogs on the premises are affected with *Linguatules*—nor can the writer find any record of these parasites in either adult or larval form having been found in Monmouthshire or Glamorganshire.

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## OXALURIA IN CATTLE.

By E. H. CURBISHLEY, M.R.C.V.S.
*Alderley Edge.*

THE collaboration of many eminent scientists in the medical profession has resulted in recent years in the acquisition of most valuable and profoundly important knowledge—especially in connection with abdominal medicine and surgery ; and they have been able to prove how such things as anaphylaxis, focal infections, entero

stasis, entero-toxins and achlorhydria, to name a few, may influence the development and course of an enormous number of diseased conditions of widely differing character. In fact, it is stated that an almost unbelievable percentage of all human ailments are directly traceable to infections from the bowel.

It is devoutly to be hoped that our own veterinary scientists and research workers may even now be engaged upon similar investigations, allowing, of course, for the different species of animals with which we are concerned, so as to help bring the veterinary profession to a comparatively equal scientific standard as is enjoyed by our rich relations in the sister profession—and help us to a better understanding of the many mysteries connected with digestion, nutrition and metabolism.

It is a far cry from the modern understanding of these subjects to the day some forty years ago, when Prof. W. Williams wrote upon the subject of Oxaluria, and if we do not now agree as to the significance of that condition, we shall at any rate have to admit that he described, in his own inimitable and direct fashion, a condition with which he was thoroughly familiar, and one which most veterinary surgeons will have recognised in practice and no doubt successfully treated on the lines that Williams considered almost specific.

About the time that Williams wrote, oxaluria appears also to have engaged the particular attention of the medical profession, and it is recorded that great discussions took place with regard to it; one school maintaining that oxaluria was a disease *per se*, and the other that it could only be regarded as incidental to some form or forms of dyspepsia. This latter view ultimately came to be the accepted theory, but it was agreed that many individuals were the subjects of an oxalic diathesis, and in them the ingestion of very small quantities of certain vegetables, like green cabbage, served to immediately render their urine oxalic. It was also proved that the urine of the herbivora is normally oxalic; so that Williams' statement that "the demonstration of octahedral crystals of oxalate of lime in animal urine could be taken as proof of a pathogenic oxaluria" was disproved.

Hoare disposes of oxaluria in one very short paragraph, and appears to accept the medical view expressed above, as conclusive; but he does not seem to give any alternate explanation of the cause of Williams' disease—unless it is included with others in his chapters on indigestion.

Williams refers to it only as an equine disease, but whatever the actual condition may be, I feel convinced that it occurs as a "seasonal" disease of the bovine—in a very far greater number of cases—than it used to do in the horse; or, at least, I can say, that in this and other

dairying districts, where heavy winter feeding is the rule—and where the cattle get practically no exercise—a very severe type of indigestion is met with, during the period when no green grass is available. The symptoms, allowing for difference of species, are very similar to those described by Williams, as being seen in the horse, and his " treatment " is quite as successful for cattle as for horses.

The only description of a bovine disease which I have been able to find, which can be said to describe the one I now refer to, is " Beggs' "—post-parturient dyspepsia—but he holds that this is a deferred milk-fever ; whilst we find our cases occurring with complete impartiality, as often in barren or " forward " cattle, as in recently calved ones—provided only that they have had a fairly liberal corn ration.

The usual history of a case is that after being more or less " off feed " for a little while, the cow eventually becomes completely " corn sick," the owner wondering how it can continue to produce so much milk from so little keep.

SYMPTOMS.—Corn-sickness : not cudding, impaired, suspended or depraved appetite ; cattle have a bright eye and show great interest in the movements of attendants at feeding time, but hang back immediately food is offered, apparently hankering after something which is never forthcoming ; variable action of the bowels ; harsh, " unkind " skin, with a gritty or greasy scurf ; frequent micturition, passing small quantities of a sweet-smelling and scalding urine, which often occasions straining and paddling ; licking of walls, etc, loss of flesh, pruritis, often very marked and sometimes apparently confined to one particular patch of skin, usually the fore-arm of the limb that is furthest from the tie-post (these are the cases which if neglected, develop an " epileptic " state). Some get attacks of severe colic and others show " rheumatoid " symptoms. Purgatives, stimulants, sedatives or " salicylates," as the case may be give temporary relief, but no real progress is made until the patients are put on a regular acid treatment. I expect that where veterinary help is not called in, very many of these cases must waste to such a degree, that their owners will eventually " send them off " as " screws," that is, such as commence early in the winter ; whilst in spring they may just hang on until grass-day corrects their digestive breakdown.

TREATMENT.—In my opinion the best line of treatment is to restrict the food to hay, or straw and water for the first few days ; then, if possible, add a few green cabbages (the disease does not appear where these are plentifully used, or at most in only very mild form). Allow no roots, and gradually return to troughage, using very little corn or cake for some weeks. Medicinally a laxative may be advantageously used once, followed by Ac. Nitrohydrochlor Dil, two

drams, two or three times a day, conjoined with Tr. Nuc. Vom. and Inf. Gentian Co., or a carminative persisted with until all symptoms subside.

The question I should like to ask is : If the protein ration needs an acid gastric juice, and the protein ferment of the pancreas, being first secreted as "Secretin," can only become active Trypsin, when the content of the first portion of the small bowel has an acid reaction (F. Smith), are we entitled to assume until the contrary is proved, that a non-acid stomach may be the cause of such imperfect protein digestion, that there will be either a tremendous wastage of imperfect end products, or that the same after absorption, may be of so sad a nature as to be unfit and incapable of complete and perfect metabolism, and so give rise to some form of poisoning, whether oxalic or not ?

Sir Frederick Smith states that hydrochloric acid is present in only small quantity in the gastric juice of herbivora, and he believes the chief ferment to be lactic acid. It may, therefore, not be correct to refer to a non-acid bovine stomach as achlorhydria—but seeing that treatment of the cases described brings complete recovery—then if want of acid is the trouble, it is more likely to be a temporary "hypochlorhydria" and not the congenital achlorhydria which is stated to occur in some humans.

The same veterinary author (F. Smith) also states that urea is formed largely in the liver, and not at all in the kidneys, which are excretory organs only. So that this disease is likely to be more intimately connected with the functioning of the liver than with that of the kidneys, and we have already seen that the demonstration of oxalates of lime in the urine proves nothing.

Is the beneficial action of the nitro-muriatic acid due to its action as an internal antiseptic, to its effect as a gastric ferment for proteins, or to its value in creating a healthy atmosphere in the small bowel, for the conversion of secretin into the protein ferment trypsin ?

F. Smith on urea : "As the result of protein decomposition in the intestinal canal, certain aromatic compounds are formed. These are united with sulphuric acid and got rid of by the kidneys as conjugated sulphuric acid. In this combination the originally *poisonous protein products* are converted into non-poisonous ones, and this change is effected in the liver. In this we have a very important function of the liver demonstrated, viz., as a neutraliser of poisons introduced into the blood by the intestines."

## EPIDEMIC MAMMITIS.

By E. P. EDWARDS, M.R.C.V.S.,
*Mold, North Wales.*

In this district during the last 35 years I have met with outbreaks of acute mastitis in cattle, which in certain years, occurring at irregular intervals, have assumed the proportions of an epidemic. The particular form and character of this mastitis also, appears to me to differ in important particulars, from the so-called "Contagious mammitis" described as occurring on the Continent, and as its ravages are very severe, a few points may be of interest. Types of catarrhal Streptococcic mastitis, seen in enzootic form, and described in France as "contagious mammitis," in Germany as "contagious catarrhal agalaxia" (Kitt), and in Switzerland as "Gelber galt," have been investigated at various times by Kitt, Bang, Nocord, and other pathologists. This appears to be an ordinary catarrhal form, of Streptococcic origin, and occurring in sporadic cases, as well as enzootically, both in acute and chronic type, and *at all times of the year*.

In 1877 Diecksrhoff described a form of epidemic mastitis affecting heifers, milch cows, and "dry" cows, one case being in a nine-months-old calf.

These outbreaks raged annually in various parts of Germany, but they appeared impartially both in summer and in winter, seemed to spread from one district to others, and Diecksrhoff recorded "micrococci, filaments of mycotrix, spores of muco-mucedo, and cells resembling those of beer yeast," in the discharges. The parenchymatous mastitis described by various observers as being due to a Staphylococcal infection, is well-known here and on the Continent, but it also occurs at all times of the year, and only attacks cows in milk. The form of the disease as I have met with it in epidemic form, is a parenchymatous mastitis, not of catarrhal type, always acute, and producing functional destruction of the quarter or quarters affected; occurs in non-parturient heifers, cows in full milk, and in a large proportion of pregnant animals which are "dry," and in a certain percentage of cases, is followed by gangrene.

Its unvarying history is, that it always occurs during the months of June, July and August, usually being at its height from the middle of July to the latter part of August.

The epidemics have been periodic in the sense that over some periods the disease has appeared as an epidemic of varying severity, for two or three successive years, to be followed by a gap of one or more years, in which but few cases were seen, but only to return again during the months named, in renewed severity and numbers. Microscopic examination of the discharges, and of smears from the gland,

invariably gave slides exhibiting enormous numbers of a very small bacillus, which was Cram positive, and stained easily with methylene blue, and the ordinary aniline dyes.

In none of the very numerous slides examined did I ever find a Streptococcus, or any other organism than this minute bacillus, and unfortunately, although I forwarded material to expert pathologists at different times, the reports I received were meagre, and did not indicate that cultivation methods had been employed.

In the summer of 1916 the epidemic was very severe, and compiling its records, I find that no fewer than 218 cases were seen during the months of June, July and August. In some instances, as many as 20 were in a single herd, and in one large herd of pure-bred Devons, there were 14 cases at the one time.

The majority of farms, however, showed two or three occurring in a herd, and a large number were single cases, even in small farms where strict isolation, and other precautions, were difficult to carry out.

From this it would not appear to be a disease of highly contagious character, and when on the other hand I point out that in such cases as those of the herds where large numbers were affected, ideal conditions prevailed, and the strictest precautions were taken, it would seem that the reason for the endemic character of the disease must be sought for in other directions.

During the prevalence of these epidemics, I always saw quite a number of cases of yearling, and two-year-old non-parturient heifers, whose rudimentary and quiescent udders were inflamed and discharging pus or sanious material, and also mares and ewes, with similar conditions, were brought to my notice.

Symptoms.—The attack was usually very sudden, animals all right at the morning or evening milking being found at the next with one or more quarters enormously swollen, hot, painful and intensely hard. Systemic disturbance was manifested by temperatures up to 106° F., diarrhœa and other gastric symptoms, rumination in abeyance, and loss of appetite. In the vast majority of cases milk secretion appears to cease at once, the discharge drawn from the quarters being a sanious, flocculent serosity, often sticky, and glutinous to the feel, and most frequently, extremely offensive in odour. In the less severe cases systemic disturbance was slighter, and the discharges, whilst they never resembled those of catarrhal mastitis, were more profuse, less or non-offensive in odour, and contained more flocculent material. In the majority of cases one quarter was affected, but in a large proportion of these, a second quarter followed, and in rare instances all four were involved.

GANGRENE.—A certain number of cases of this condition have always appeared during these epidemics, and in an outbreak involving about 70 animals during July and August, 1924, seven cases of gangrene were met with, and of these, those animals which survived the local death of one or more quarters, made more rapid systemic recovery, than those running the ordinary course.

In two of the seven cases just cited, so sudden and fatal was the incidence of the disease, that I was actually notified of them by the police, as suspected cases of anthrax, the animals having been turned out after milking the previous evening, and found dead next morning.

I have for long been inclined to think, not only that these cases are distinct in origin from the epidemic form, but also that there are two forms of gangrenous mastitis in the cow. In the form just mentioned as being so rapidly fatal, if they are seen during life, the affected quarters are not only dark purple in colour, and cold, but are also emphysematous and crepitant, and the teat, on being drawn, voids a most offensive gas.

I regard the presence of gas in a sudden case of gangrene as an invariably fatal symptom, for whilst I have found crepitance and foul gas in a few cases during the secondary stages of the local death of a quarter in the gangrene which manifests itself in acute mastitis, and have had recovery, death has, in my experience, always followed within 12 to 24 hours in the type described. Reverting to the ordinary type of cases in these epidemics, the course of the majority of those which recover is that of an acute inflammatory process, gradually, and within about six weeks in favourable cases, ending in a catarrhal discharge, but almost always involving complete functional destruction of the quarters affected.

TREATMENT.—The various measures, both local and systemic, tried during different epidemics met with little distinctive success, but the best line of treatment appeared to be the injection into the udder of various antiseptics, such as chinosol, dibromin, and citrate of soda in sterile solutions, and certainly they had the merit of reducing, or abolishing, the offensiveness of the discharges, and usually appeared to be followed by a reduction of febrile symptoms, and general systemic disturbance. The use of mixed phylacogens and vaccines, appeared to be of little, if any, value, and it seems to me scarcely to be wondered at, as none of those offered to the profession are of bovine, much less of mammary origin. I corresponded with a very well-known firm of makers of mixed stock vaccines of equine origin, asking whether they made similar ones of bovine origin, and was told that they did not, and I was very politely informed that " modern research tended to the opinion that vaccines of equine origin were more potent,

in bovine infections of mixed type, than those prepared from the latter infections direct." !!

GENERAL REMARKS.—I do not suppose for a moment that this district has the unenviable monopoly of this particular epidemic disease, but I cannot recall any record of so persistent an appearance of epidemic mastitis on such a scale. Some 20 years ago I described, in *The Record*, one of these outbreaks, and asked if other practitioners had met with a similar experience, the only response being, I think, from Ayrshire. My neighbouring colleagues, on enquiry, do not appear ever to have met with such epidemics, and yet Continental records seem to have noted a similar incidence of endemic mastitis in various districts, and with a definite geographical distribution.

To my mind the most interesting feature of these outbreaks is their distribution in time, which constantly refers to the months of June, July and August, and personally, I am inclined to think it to be due to an infection carried by flies. I am told that it is a common custom during the hot summer months in Holland, to envelop the udders of the dairy cattle at grass, in muslin covers, with the object of excluding the attentions of insects, and it would be interesting to know the reason for this custom. Speaking generally, mastitis is a disease which in all its various forms, causes enormous economic losses, both from actual deaths, and the decreased value of our milking stock, and yet research seems little more forward since the microbic origin of its more serious phases, was indicated in 1877 by Dieckerhoff, followed by the researches of Nocord, Mollereau, Bang, Kitt and others, but we certainly seem little nearer to effective treatment or prevention.

The rational line of procedure toward these desirable ends, appears to be research into the definite identification of the causal organisms, and in the words of the *Veterinary Encyclopædia*, "The time is ripe for the preparation of an anti-mastitis serum in acute cases, obtained by hyperimmunisation with several strains of the organisms found in actual cases of the disease."

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## BUSH SICKNESS.

### A NEW ZEALAND DISEASE OF RUMINANTS.

BY H. A. REID, O.B.E., F.R.C.V.S., D.V.H., F.R.S.E.

THE study of what are termed "Deficiency Diseases" has led to the acquirement of much information concerning some of these obscure conditions. It has shown how apparently slight defects in foodstuffs or an ill-balanced ration may be responsible for profound disturbances of normal metabolism. Under the terms "accessory food factors" (Gowl and Hopkins) and "Vitamins" (Casimir Funk) are included

substances indispensable to nutrition. The interests of students of dietetic diseases have been largely absorbed in the consideration of conditions wholly or partly dependent upon these factors, possibly to the neglect of others equally important which have more recently received attention.

From time immemorial deficiency of mineral elements in the blood and body tissues has been known or assumed to be associated with certain ailments, and treatment based upon this assumption has been practised regardless sometimes of the fact that beneficial results can only be attained provided these are presented in a form available for assimilation.

To-day, thanks to the painstaking labours of various investigators, and especially to the assistance afforded by the physiological chemist, this important principle has become generally recognised. The admirable work conducted at the Rowatt Institute and elsewhere, has contributed largely to our knowledge of this subject and has helped to dispel the mystery surrounding certain phenomena with the nature of which we are now familiar.

New Zealand, a country singularly free, generally speaking, from diseases to which livestock elsewhere are susceptible, offers some striking examples of affections included in the above category. Perhaps the most interesting of these is that known locally as " Bush Sickness " or " Bush Disease." The following brief account will serve to illustrate some of the characteristic features of this complaint with which members of the veterinary profession in other parts of the world may not be acquainted.

Bush Sickness is a term denoting a condition affecting cattle and sheep confined to a definite area of the North Island of New Zealand. Its importance will be appreciated from the fact that in a relatively small country like New Zealand, at least a million acres are estimated to be involved and rendered practically worthless for purposes of stock farming. It derives its name from the fact that the unhealthy area was formerly covered by forest, portions of which have now been cleared for settlement. The land, generally situated on a high level, is of volcanic origin. The soil as a rule, is a light, porous, pumice. The water supply is generally surface storage, with, in addition, in some districts, artesian wells.

Young stock appear more susceptible than those of more mature age. Symptoms usually occur from five to twelve months after the animals have been grazing in the affected locality. Sheep rather than cattle are more liable to suffer, and more readily succumb to the effects of the complaint. The land upon which the trouble occurs, when cultivated, is capable of producing excellent crops. The pastures

carry a luxuriant growth of grasses, principally cocksfoot and clover.

Equines possess a solid immunity and may be grazed on country certainly fatal to ruminants.

SYMPTOMS.—The symptoms of Bush Sickness are similar in both cattle and sheep. The salient features are progressive anæmia and wasting. A gradual loss of condition while having access to abundance of foodstuff indicates the onset of the complaint. In sheep the wool becomes harsh and lustreless, showing a tendency to lose its natural curl and to assume the texture of hair. There may be a slight œdema of the pendulous parts and occlusion of the lachrymal duct causing an overflow of tears—dirt and dust adhering to the region of the orbit. To the uninitiated these signs are often attributed to infestation by parasitic worms.

In cattle the disease pursues much the same course. They are hollow in the flank, the coat looks dull and " staring," and the normal, sleek appearance is soon lost. A steady falling-off in condition and gradually increasing weakness leave no doubt in the mind of the experienced observer as to the nature of the trouble. Affected animals are easily approached and handled. Sheep become extremely listless or, when attempting to evade capture, frequently fall. The final aspect is that of starvation amidst plenty. It is not uncommon to discover young beasts lying *in extremis* among a luxuriant growth of clover.

CAUSE.—Before scientific investigation revealed its true nature, all kinds of theories, mostly of a wildly speculative order, were current to explain this unusual phenomenon.

In 1910 the New Zealand Department of Agriculture initiated what has proved to be a long and tedious enquiry with the object of ascertaining the origin of this complaint.

Pathological and bacteriological investigations, apart from determining the presence of a secondary anæmia which one would expect to be associated with a condition of chronic malnutrition, yielded negative results, and experimental inoculations of laboratory animals and sheep and cattle with products secured from cases at various stages of the disease, proved equally unavailing. The theory that the trouble might proceed from vitamin deficiency was, in view of the abundance of fresh green stuff freely consumed by affected subjects, early dismissed. The enquiry resolved itself into a research involving the chemical analyses of the soil, water, and herbage from the affected locality, as well as the tissues and body fluids of animals suffering from the complaint. These observations were conducted by Mr. B. C. Aston, F.I.C., Chief Chemist to the Department of Agriculture, who

compared his results with those obtained from analyses of similar material derived from healthy districts.

These investigations led eventually to the discovery that the soil in "bush sick" territory is deficient in certain elements notably iron, normally present in an available form in herbage. The iron salts were found to exist in the form of the extremely insoluble silicate rendering it unavailable for plant life. Stock grazing on bush sick pastures are consequently deprived of this important and vitally essential mineral constituent. This observation does not explain the immunity enjoyed by equines. Further enquiry is necessary to determine why ruminants alone are susceptible.

It has, however, provided a basis upon which treatment may be undertaken, and suggested means of prevention which in practice have been followed by very encouraging results.

TREATMENT.—As a result of the foregoing conclusions it has been found possible, even in advanced stages of the disease, to adopt effective curative treatment.

The administration of the syrup of phosphate of iron has proved very beneficial. But better results follow the use of the double citrate of iron and ammonia. Ten ounces of the crystalised salt are dissolved in one gallon of water, and two ounces of the solution are administered night and morning. Within a month signs of improvement are noticeable, and recovery takes place in three to four months.

A more practical method applicable to flocks and herds, takes the form of lick preparations. The lick which, so far, has given the best results, contains Ferric Chloride 4 per cent., calcium hydrate 10 per cent., sodium chloride 20 per cent., calcium sulphate and water 66 per cent. This is supplied in the shape of bricks. It is, as a rule, necessary to resort to additional treatment in order to bring about complete recovery.

The measures related, though of interest from a therapeutic point of view, do not offer a practical means of dealing with the trouble. By removing stock periodically from sick to clean areas it is possible partially to utilise affected country. Stock may even be fattened on the land, though they cannot be reared on it.

PREVENTION.—Cultivation, and the use of phosphatic manures tend to restrain the appearance of the disease. The following manures have furnished the best results in assisting to eliminate "bush sickness": (1) Superphosphate and basic slag mixed in equal parts; (2) Superphosphate and lime; (3) Guano.

Lime alone has been found to be useless and even harmful, while basic slag mixed with superphosphate gives better results than slag alone.

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Actual farming operations in the worst affected locality are being carried on by the New Zealand Department of Agriculture. By adopting the measures alluded to it has proved a payable proposition. As various remedies are tried on a practical scale it is hoped that means of eradicating the disease applicable by ordinary stock farmers will be discovered, and that the problem of rendering the land suitable for settlement will be solved.

## Clinical Articles

### THE SURGICAL TREATMENT OF STURDY IN CATTLE.

By R. JONES, M.R.C.V.S.,
*Towyn, Merionethshire.*

MANY years ago I reported six or seven consecutive cases of sturdy all of which I operated on successfully. I cannot recall the date of the article. I have, in the meantime, operated on scores with 90 to 95 per cent. successes.

The farmers in this district have comparatively small acreage of low-land, but have large sheep-walks, and are obliged to keep two to four sheep dogs, which are allowed to roam about the premises when not used on the mountains. Invariably these dogs are infested with tape worms, and segments are deposited on grass-lands adjoining the farmstead, where young stock are allowed to graze.

To show how common this complaint is in this district and rural parts of the country generally, where young stock are allowed to graze and dogs roam about at liberty, on one particular farm I operated on three yearling cattle on the same day, and for the same owner I have operated on six altogether during my residency in the district. Two and a half years is the oldest age that I have treated, and the oldest animal that I have seen or heard of suffering from the complaint.

I need not say that there was no external indication of the head pointing where the hydatid was situated. In fact, amongst the number of cases that I have operated on, only very few had perceptible softening of the bone, and this in those that were young. Also, I have seen slight bulging of the forehead on the side that the hydatid existed, and discerned a more solid sound when tapped with a hard object and more sensitiveness to taps.

I have refrained from making any remarks or observations about the life history of the Taenia Coenurus, the cause of sturdy, as it is well known and can be studied from text-books by any one interested in the disease.

I confine my observation to the clinical and legal aspects, and the surgical treatment of the disease. The symptoms vary with the location of the hydatid and in intensity in the same case. I have known a beast operated on a day or two before unable to eat, get up again and go on eating for some time.

The proper thing for the owner or person in charge to do as the symptoms develop is to put the patient in a field where it cannot get drowned or injured, or in a safe loose box pending date of operation.

In the majority of cases the cyst will be found to be located in one of the hemispheres of the cerebrum ; if in the centre the symptoms are well defined. If in the left or right, as the case may be, the subject will make acute turns to the side on which the hydatid is located. It may be found anteriorly or deep in the hemisphere. The symptoms will be the same, provided the pressure does not affect other parts of the brain, but if the pressure affects the other hemisphere the beast will move forward, bearing to the right or left, according to which side most pressure is exerted on, and the turning much less acute.

If the cyst is in the centre, the beast walks with his head up and nose out with much less control over its movements. If the cyst is located in the cerebellum or exerting pressure on it, the beast loses control of its movement and becomes partially blind.

About two years ago, when operating on a two-year-old that had been bought some weeks previously at a sale, I was asked how long the disease had existed, and in case the heifer died would the owner be justified in claiming compensation ? I was very pleased with the operation, and told the owner he need not worry about getting paid for the heifer, that she would recover, unless he wanted to claim for my fee. He replied, " I shall be quite satisfied if recovery takes place." Up to that period I had no demonstrable evidence as to the time from the first abnormal signs of some affection of the brain, for the symptoms to develop, to enable me to make a diagnosis of a condition calling for surgical treatment. During the last 18 months I have had four cases under observation, with accurate knowledge of the time the first signs were observed to the date of the operation.

My attention was called to a young heifer on August 1st by the owner. I went to the field to examine the case. The owner remarked that he thought sturdy was commencing. Nothing abnormal could be seen until we made an attempt to catch it. A peculiar wildness was shown on close observation. It was operated on the following November 7th.

Second Case.—First signs about Christmas ; operated on in the following August 28th.

THIRD CASE.—First signs in November; operated on May 30th.

FOURTH CASE is rather interesting, inasmuch as it had been running from Christmas, 1924, to November 13th, 1925, before it was operated on. It had gone to a very bad state, being down on the ground and not eating, green-stick fracture of the horn on the side that the cyst was in. I found a clot of blood under the pericranium, which I cleaned the best way I could. The beast has made a complete recovery, more or less to my surprise.

It will be seen from these recorded cases and facts that it takes several months for serious symptoms to develop from the time that the embryo fixes itself in the brain.

To record these facts has been the incentive for me to write this article.

METHOD OF OPERATION AND INSTRUMENTS REQUIRED.—Scissors, scalpel, trephine (Mannington ¾), gimlet, trocar and cannula, artery forceps, needle and thread.

I clip the hair close off the front of the skull, put the beast down and tie the legs. I thoroughly wash the front of the skull with antiseptic water and soap. The instrument in the meantime is placed in boiling water and antiseptic. I make a cross-section in the skin mid-way between an imaginary line over the prominent part of the eyes to the top of the skull; scrape back the flaps and pericranium, bore a hole through the bone with the gimlet, insert the centre-bit of the trephine and saw through the bone. If the cyst is not on the surface, I insert the trocar and cannula, withdraw the trocar, and if the cyst has been penetrated clear fluid will escape. It is important to get the cyst out if possible. Sometimes it will protrude when the cannula is withdrawn, if not the forceps can be introduced through the opening left by the cannula, and opened quietly in the brain, and in closing often grips a portion of the cyst.

I have killed one or two in trying too many times to secure the cyst.

At the finish of the operation, all clots and blood to be mopped up with cotton wool, the four corners of the skin stitched together, and a pitch plaster placed over seat of operation.

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## AN UNUSUAL OUTBREAK OF ANTHRAX.

BY R. A. PHILP, F.R.C.V.S.,
*Brentwood.*

THIS occurred in a well kept herd of dairy cows. The first case that I was called to see was a cow in milk that was showing the following symptoms. Profuse purgation with a very offensive odour, respirations quick but not laboured, noisy laryngeal sounds, a most

noticeable fiery and blood-shot appearance of the whites of the eyes, and a high temperature of 106°. This animal died during the following night. A blood smear was made and anthrax confirmed.

During the following week five other cows became affected, all showing the same symptoms. Two of these died and the disease was confirmed after death in both instances. The other three made rapid recoveries. They all looked like dying animals and it was an agreeable surprise that 50 per cent. recovered, no special medicaments being used.

For many years one's experience of anthrax in bovines is that the patient is nearly always found dead, and that the outbreak is limited to one case ; also that no preliminary symptoms are observed.

The cause of this outbreak could not be traced to any definite conclusion.

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## A CASE OF BOVINE COCCIDIOSIS.

By NORMAN BISSETT, F.R.C.V.S.,
*The University of North Wales, Cardiff.*

The affected animal was a four-year-old cow which had suffered from persistent and obstinate diarrhœa for 12 months. On the farm where she was kept, several cattle had previously been found to be affected with Johne's Disease and it was thought that this was a similar case. The animal was seen by the writer in the course of other investigations, and, as he was interested in the diagnosis of Johne's Disease by examination of rectal scrapings, fæces, etc., he took samples of freshly passed diarrhœa and also a scraping from the rectum.

The cow was kept in a stall at the end of a cowshed and, to give the owner his due, only one other animal was kept in the shed at the farther end of the building. The walls at the side of, and behind the affected animal, and also the partition of the stall in which it was kept, were absolutely plastered with the diarrhœa to a considerable height. The owner supplied the somewhat meagre history mentioned above and in response to questions stated that the diarrhœa was occasionally blood-tinged and containing clots of blood, while at other times no signs of blood was observed. He mentioned that the sanguinolent diarrhœa appeared to occur at more or less regular intervals, but could not state the length of time between such appearances. He was, however, very emphatic regarding the offensive odour of the fæces which indeed was quite noticeable on entering the cowshed.

At the time of examination by the writer, the diarrhœa was not obviously sanguinolent. It was very fluid, dark in colour, extremely

evil smelling, and contained a large quantity of mucus. The animal was extremely emaciated and the reason for her retention for 12 months must be put down only to a Micawber-like disposition on the part of her owner. The temperature and pulse were practically normal.

A thorough examination was first made of the rectal scraping. It has been the experience of the writer that, even in cases of Johne's Disease of comparatively short standing (judging from external appearances) examination of smears from rectal scrapings will almost invariably reveal the bacilli. In this instance, however, no bacilli could be found, nor could they be demonstrated in the sample of fæces even when antiformin was employed.

Wet films of the fæces were then examined and, under the $\frac{1}{3}$ objective coccidial oocysts were found in fairly large numbers. Under the $\frac{1}{6}$ objective, however, very numerous vermiform and motile bodies—the sporozoites—were distinguishable, moving rapidly about in the film. The sporozoites were much more numerous than the oocysts. A diagnosis of coccidiosis was therefore made.

Treatment suggested by the writer and carried out by the owner's veterinary surgeon consisted of alternate doses of "Cyllin" well diluted with water and large doses of Tinct. Camph. Co. In addition a solution of two per cent. Lysol alternated night and morning with a one per cent. solution of alum was injected into the rectum.

Unfortunately pressure of work prevented the writer from following up the case in detail, but it was reported about four months later that the cow had made a complete recovery and was in calf.

It is, of course, quite possible that the animal had actually been affected with Johne's Disease in spite of the negative results of the examination of the rectal scraping and the fæces. There was, however, no doubt regarding the presence of coccidia.

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## DISEASE IN CATTLE CAUSED BY EATING GRASS MIXED WITH TORMENTIL.

By W. T. HEWETSON, M.R.C.V.S.,
*Brampton, Cumberland.*

THIS is a subject that may be of interest to practitioners who practise in high-lying districts. In my locality there are two grazing farms: one situated in the uplands and the other on the borders; the herbage consisting of rough coarse grass mixed very largely with tormentil, where the complaint is common; particularly in the summer and autumn months and when the seasons are dry. Some years the disease fails to make its appearance, whilst in others several cases arise on both farms. Why this should be I am unable to say, unless the dryness of the seasons may be a predisposing cause.

THE FIRST SYMPTOMS OF THE DISEASE.—The animal appears rather dull and listless. It is, to use a local expression, "how"; that is, it is tucked up in the lower flank and hollow in the upper flank, as if it had not had its normal quantity of food. The fæces are passed in small quantities, are liquid in consistence and dark in colour. At this stage of the disease there is not any grunt or moan, and unless the farmer is familiar with the complaint, he will often fail to discern anything wrong with the animal. It is very important that the disease should be detected in its first stage, as it is a very serious complaint, and if the animal is allowed to go another twenty-four hours without treatment, it may be found in a state of collapse, unable to rise, with symptoms of coma, or it may be found dead. The symptoms are varied in each case, according to the stage of the disease. First, you get dullness and hollowness of the flanks, with slight diarrhœa; the breathing may be normal. On the other hand, it may be very quick, as if the patient was suffering from congestion of the lungs or pneumonia. The temperature also varies; it is not the same in every case. In some it may be normal; in others as high as 106° F. This applies also to the external temperature. The animal occasionally grinds its teeth, rumination is suspended, and the appetite is almost lost. In twelve or twenty-four hours symptoms of paralysis make their appearance, the animal will stagger and walk with an uncertain unsteady gait; it may bore its head persistently against the wall. Finally, it will lose use of its legs and will not be able to rise to its feet. Coma will then soon set in and the animal will die. Should the patient be found in a state of collapse and coma, the prognosis must always be most unfavourable. It is a serious complaint, and unless observed and treatment adopted at once or as soon as possible, the animal will die. There is still hope of a recovery, even if the animal shows an unsteady gait or bores its head against the wall; but should it be down, unable to stand, and at the same time showing head trouble or coma, the patient will die; at least, this has been my experience.

POST-MORTEM LESIONS.—The chief lesion is to be found in the third stomach. The stomach is full and the contents dry, having the appearance of dry snaps between the leaves or folds, and when removed, the mucous membrane adheres to them, leaving a slightly congested surface beneath. The mucus membrane of the fourth stomach is found in a congested and inflamed condition, and this may, and often does, extend into the small bowels, where you get red congested areas on the mucus coat. Until you have demonstrated to the owner by *post-mortem* that the animal is suffering from stoppage, you cannot convince him that there is a stoppage, because the patient

passes liquid fæces. I did not at first form any definite opinion why so many cattle on these two farms should become affected with this complaint, until in one year there were twenty-three cases on one of these farms, all suffering from this particular disease. The owner of the farm mentioned it to the Ministry of Agriculture and Fisheries, and Mr. Berry, one of the chief Inspectors, was sent to investigate. Mr. Berry came to the conclusion that the disease was due to the large quantity of tormentil found amongst the grass and I am convinced he was right. Tormentil, on the moorland farms, is often pulled in the autumn and hung up to dry in the kitchen of the farmhouse, like sage, and when a calf has diarrhœa, a handful is boiled in a pint of water and a wine-glassful of the tormentil infusion is given two or three times a day until the scouring stops.

TREATMENT.—The animal, whether a stirk or cow, is immediately brought inside and housed in a comfortable loose box, bedded with moss litter or sawdust. It is comfortably sheeted to keep it warm, even though the weather is warm. At the commencement the patient receives a dose of Epsom salts, with gentian or ginger, sweetened with treacle, in a quart of warm water. If it can stand this it is a good sign, as sometimes when the first dose of physic is given it causes the retained putrid contents of the first stomach to be moved on into the fourth stomach and into the small bowels. This, in some cases, acts as a poison. The eyes of the patient sink in its head, it develops a soft moan, and dies from 12 to 36 hours afterwards. Should the patient appear no worse after receiving the salts, two to four pounds of treacle is given twice daily, according to the age and size of the animal, and to which vegetable tonics and nux vomica pulv is added ; of the latter about one dram daily is usually given. Sodium bi-carb. is also given in cold water twice daily. If the patient is disinclined to drink, which is often the case, a handful of common salt is placed on the tongue twice daily, as this causes a thirst, acts as a tonic, antiseptic and excites peristalsis. If the patient persists in passing only liquid fæces, it is advisable to give two or three pounds of fat bacon, cut up into half-inch squares and boiled in water for half-an-hour, allowed to cool and given by means of a horn. This causes the fæces to be passed more normally ; that is, the fæces become more solid.

DIET.—This is important. No dry food or fodder of any kind must be allowed. The patient must be fed on liquids and semi-liquids until cured. This generally takes from three to four weeks. The food given consists of milk, boiled linseed, scalded bran, boiled turnips, boiled oatmeal gruel, calf meal, etc. To show the importance of this, one of the farmers had a cow under treatment ; on the fifth day she was going about the box and looking as if she did not ail anything,

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bellowing to be outside. As they were leading new hay through the farmyard, the owner thought it would not do her any harm to give her a small foddering of this new hay. This was about 1 p.m., and the next morning she was found standing boring her head against the wall. By noon she was down, unable to rise, and before evening she was dead. The stoppage is so severe and the contents of the stomach so dry in this disease that it takes time to remove it all, and patience must be exercised.

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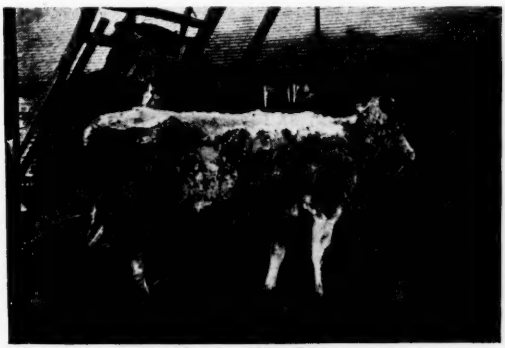
## " BLAINE " FOLLOWED BY SKIN NECROSIS IN A COW.

By Ó. V. GUNNING, M.R.C.V.S., D.V.M.,
*Tutbury.*

THE following case of a cow suffering from an unusually severe sloughing of the skin is of interest. The history given by the owner was that the animal had recently suffered from a severe attack of what is known locally as " Blaine." This he treated himself. When I saw the animal, it was as the photograph somewhat imperfectly shows, practically denuded of cuticle over the whole body—the head, neck, back, both sides, and even to some extent, the limbs. In some parts where the old skin was still adhering, it could be literally pulled off in pieces 8 to 10 inches square, leaving a tender surface underneath. The animal was eating well, but the new skin was so sensitive that she would not move unless forced to do so. It even seemed extremely painful for her to move her head.

A soothing ointment, containing clarified horse fat as a base, was liberally applied to the denuded region, and the animal made a gradual recovery.



The condition referred to above, and popularly known by farmers (and even veterinarians) as " Blaine," is one of those unfortunate

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diseases which apparently does not possess a scientific name. This is made the more unfortunate as the old clinicans seemed to use the term very loosely. Consequently there appears to be some confusion as to what " Blaine " really is. The condition as understood by the writer is of common occurrence in dairying districts, and it is, therefore, surprising how little mention is made of the condition by modern veterinary authors. The writer can only find two descriptions of the condition in his available library. One by Woodroffe Hill, 1882 ; the second, a description of a similar condition, by Steffen, under the name of Thurow's Disease. Wooldridge mentions a somewhat different condition under the name of " Blaine," in which intense dyspnœa is the prominent symptom generally, when the animals are being driven, and when a large bleb is found under the dorsurm of the tongue and pharynx. But he further states there is some doubt as to whether this is a genuine condition or not. He possibly includes the condition I refer to under urticaria, although the description is not definite.

" Blaine," as understood by the writer is a form of urticaria characterised by sudden onset, and the most alarming symptoms, the skin about the eyes, head, neck and chest is puffed up to an extraordinary degree. Steffen describes his condition as follows :—

" The cow stops eating suddenly, sometimes abruptly, so that the last mouthful of feed is held between the lips. The animal seems terribly distressed almost instantly and stands immovable. Salivation and lachrymation become marked. Defecation and micturition seemed to be performed involuntarily or spontaneously. The animal trembles markedly, and soon begins to shift her weight from one leg to the other repeatedly. While the observer is looking on, he sees the cow growing in size ; the distention is not confined to any particular region. The sides of the neck, shoulders, thorax, glands, hips, thighs, udder—in fact, the entire integument—seems to undergo inflation." (In the writer's experience the condition is usually confined to the region of the head and neck, and possibly the vulva.)

In the course of an hour or so the swellings recede and as a rule, by the time the veterinary surgeon can arrive, the animal is rapidly resuming her natural contour, no worse for the experience, with the exception of being off colour for a day or so.

Sloughing of the skin in varying degrees of severity, and peeling of the teats, seems to be a frequent sequel to the condition.

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" Special Cattle Therapy." Steffen.
" Veterinary Encyclopædia." Wooldridge.

## A NOTE ON THE CAUSE OF CHRONIC TYMPANITIS IN CATTLE.

By HENRY TAYLOR, F.R.C.V.S.,
*Haywards Heath.*

Acute tympanitis is pretty common amongst cattle and its essential condition consists in an inordinate elaboration of gas or gases (probably of the marsh-gas series chiefly) from the ingesta in the rumen. Coupled with these excessive productions of gas there must evidently be a disturbance of the mechanism for getting rid of it; for under *ordinary* circumstances when the production is at the normal rate, the animal gets rid of it via the œsophagus. Reasoning from that, one would deduce that if the œsophagus were prevented from exercising that function, the gases would accumulate and a condition of chronic distention of the rumen would result. To carry the deduction a little further, what is more likely to interfere with that function of the œsophagus than the pressure upon it of an enlarged lymphatic gland in the mediastinum of the thorax. *Ipso facto*, therefore, if one meets with a case of chronic tympanitis, it should in all probability be due to an enlarged tubercular mediastinal gland; and so we were taught. Since the Tuberculosis Order came into force I have met with at least six cases in which the mediastinal glands were of *enormous* size, i.e., the diameter of a cocoanut and twice as large as one, and in which the owners asserted that the animal had never suffered from the complaint in question. In fact, out of 28 cases slaughtered under the Tuberculosis Order, not one had suffered from chronic tympanitis.

Chronic tympanitis is not so very common, but it is generally supposed to be in some way due to Tuberculosis. It may be, but from what I have seen at *post-mortems*, I have grave doubt as to enlarged tubercular glands being a cause. I have only had one opportunity of making a *post-mortem* examination on a definite case of chronic tympanitis. The subject was a yearling steer which for some weeks had been *constantly* "blown," and which, in spite of repeated puncturings and doses of various medicines, still remained in that condition. After death, it was found that the rumen and the left flank were adherent throughout their whole extent. There had evidently been a diffuse peritonitis which was *not* tubercular. It seems feasible in this instance to assume that interference with the muscular contractions of the organ due to the adhesions, was the cause of the distention.

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## POST-PARTUM HÆMORRHAGE.

By R. HUDSON, F.R.C.V.S.,
*Retford.*

In animals, hæmorrhage after parturition is usually due to lacera-

tion of the wall of the vagina or uterus, or an open umbilical vein. It is most commonly met with in primipara particularly when in fat condition; also when the act of parturition has been premature, and when the genital passage has been over-stretched by a large fœtus or a breach presentation. It normally follows immediately after delivery, or within a few hours, but occasionally two or three weeks may elapse, when it follows the opening of the artery after the separation of a slough.

There may be a continuous stream of blood from the vulva, or clots may be expelled at irregular intervals.

All cases should be regarded as serious, for the patient may bleed to death in three to forty-eight hours.

Various procedures have been suggested for arresting hæmorrhage in such cases, viz. :—

Injections of cold and hot water into the vagina.

Placing the hindquarters in an elevated position.

Subcutaneous injections of adrenalin and ergot.

Dosing with various drugs, such as Ol Tereb., Liq., Ferri Perchlor., etc.

All may be regarded as useless, the only safe procedure being the stoppage of the flow of blood by pressure on the bleeding vessel.

If a careful search be made for the laceration in the vaginal or uterine wall, the spurting of the artery can often be felt, or if not, the artery may be felt through the wall of the vagina or uterus in the neighbourhood of the wound. If bleeding is taking place from the vessel which has been found, it will be noticed that it has quite a distinct feel, the pulsation being more vibratory.

A pair of large artery or roaring forceps (Hobday's) should be placed on the bleeding vessel in the wound or where it can be felt through the vaginal wall. They should be left on three days.

If the tear is near the entrance of the vagina, a ligature may be passed round the artery with a curved needle. Plenty of tissue should be enclosed and the ligature passed round twice before knotting, thus making more certain that the artery is taken up and the necessary pressure applied.

Serious bleeding from the umbilical vein may happen, and in one case the animal was nearly dead on my arrival. The vein should be found and ligatured.

Adrenalin and stimulants are good in all cases which are suffering from the loss of a large quantity of blood. The action of Adrenalin is sometimes wonderful.

# A REPORT ON THE USE OF BEVAN'S ABORTOSCOPE FOR THE DIAGNOSIS OF CONTAGIOUS ABORTION IN CATTLE.

By J. F. D. TUTT, M.R.C.V.S., F.L.S., F.Z.S.,
*Winchester.*

At the request of Professor Hobday, who kindly sent me six Abortoscopes to test, I am recording the results and the history of the cattle on which the tests were made. The cattle were selected from a herd that was known to be heavily infected with contagious abortion.

(1) Shorthorn Cow named "Plum."—This cow slipped a dead calf on April 11th, 1925, and reacted to the Agglutination Test in June 1925. She is now seven months pregnant. Gave a definite reaction with the Abortoscope on January 30th, 1926.

(2) Red Shorthorn Cow named "Maggie."—This cow slipped calf on May 11th, 1925, and reacted to the Agglutination Test in June 1925. Is now 4½ months pregnant. Gave a definite reaction with the Abortoscope on January 30th, 1926.

(3) Red Shorthorn Cow named "Crumple."—This cow slipped calf on October 20th, 1925 (due on November 7th), calf was alive, but died the same night. Reacted to the Agglutination Test in July 1925 (when abortion was found to exist in this herd, 38 of the pregnant cows were tested and 21 reacted, this being one of them). Gave a definite reaction to the Abortoscope on January 30th, 1926.

(4) Roan Shorthorn Cow named "Kimpton Daisy."—This cow calved to full term on July 17th, 1925, but the fœtal membranes were retained two weeks. Reacted to the Agglutination Test in May 1925. Had had two calves before being bought by present owner and was supposed to be in calf again when bought, but came into œstrum three months after purchase. A definite reaction to the Abortoscope was given on January 30th, 1926.

(5) Roan Shorthorn Cow named "Kimpton Dolly."—This cow was due to calve on August 10th, 1925, but calved on August 8th, 1925. Reacted to the Agglutination Test in July 1925, being tested at same time as No. 3. Gave a definite reaction with the Abortoscope on January 30th, 1926.

(6) Red Shorthorn Cow named "Lily."—This cow was due to calve on November 5th, but calved on November 10th, 1925. Reacted to the Blood Test in May 1925. Had three calves, the first one being an eight months calf born in November 1923. Gave a definite reaction with the Abortoscope on January 30th, 1926.

## TWO CASES OF ACUTE LEAD POISONING.

By CHARLES RENFREW, M.R.C.V.S.,
*Broadway, Worcestershire.*

### Case No. 1.

I received a call at 4 p.m. to attend to four cattle seriously ill and one already dead; poison suspected.

*History.*—Another veterinary surgeon had been called in to attend the animal first affected, and on his arrival it was found to be dead. He advised owner to send the carcase to the knackery, at which premises he proposed to make the P.M.

A *post-mortem* was performed and the report the owner received was that animal was probably poisoned, but no suggestion was made as to the toxic substance suspected as being responsible.

*Diagnosis.*—I visited the field in which the animals were taken ill with a view to discovering the toxic agent. Failing to find any poisonous herbage, I examined carefully an old tumbledown shed and found it to be the remainder of a railway carriage.

Examination of the roof of this revealed a canvas covering coated with a white paint to thickness of $\frac{1}{32}$ of one inch, which I suspected to contain white lead. This canvas was torn to shreds and pieces were lying about, showing marks of the animals' teeth.

On enquiry I was told that this shed had blown down in a storm two days before.

*Treatment.*—I was now convinced that lead was now the cause of the disease and I gave all the animals in the field at the time of the first case—14 in all—a full dose of mag. sulph., followed by stimulants and pot. iod.

On returning home I tested the canvas and found lead in large quantity.

Animal No. 1.—This animal was so ill that, although I told the owner that I would treat it, at the same time I said it would certainly die, which it did do in 18 hours.

Animal No. 2.—Completely blind and semi-paralysed; had had a fit and fallen into a pond and was very cold. It regained its sight and the use of the limbs and jaws, but died from lung trouble, due to falling into the pond in its weak state subsequent to the poisoning.

Animal No. 3.—Completely blind and paralysed. This animal recovered.

Animal No. 4.—Partially blind and staggering gait. Recovered very quickly.

The Remainder (10).—All these animals recovered without ever showing any really marked symptoms of the disease, although I think that they had partaken of the canvas, but not in any quantity.

ANIMAL NO. 1—*Post-mortem.*—The whole of the intestines of this animal were bright yellow, due to the formation of lead iodide in the ingesta. The tissue of the liver and kidneys was also yellow.

CASE NO. 2.

Called on December 16th to see a heifer suspected of having contracted a severe chill.

*Symptoms.*—Animal partially blind, weak in the hind limbs and salivating freely and running her head against the walls of the box.

*History.*—Search revealed lead paint, spilt by workmen a few days previously, in the bottom of manger.

We found a paint can that had been licked out; and the owner was positive that this can was not in the manger two hours before, when he first noticed the animal to be ill.

This fact is important, as two days later a second animal was taken ill. This we concluded was the animal which had licked out the tin.

*Treatment.*—Treatment identical with that previously described was used and both animals made an uninterrupted recovery. The second animal took three weeks to become apparently normal; the first one only seven days.

GENERAL CONCLUSIONS AS REGARDS SYMPTOMS.—(i) Blindness was very well demonstrated; (ii) Bowel and fæces torpid and evil smelling; (iii) Tendency to rest head against any solid object frequently.

*Mortality.*—In these two cases (altogether covering 17 animals), it would seem that when the dose of lead was large; death—where uncomplicated by other affections—was very quick and frequently accompanied by a fit.

*Course of Disease.*—The symptoms were most severe very soon after their onset, and then death ensued or recovery steadily went on and the disease was described by the term "acute" in every sense of the word. This is certainly a very important conclusion in view of certain self-assertive *human medical* evidence to the contrary in a recent important legal action.

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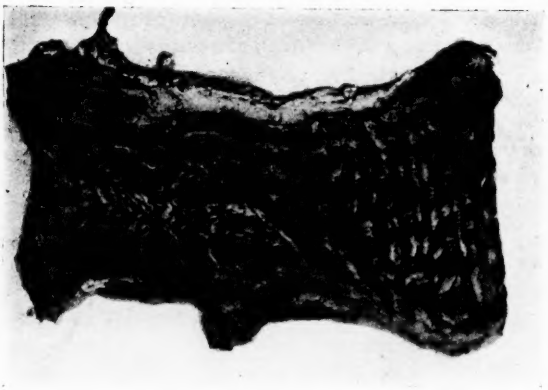
## JOHNE'S DISEASE.

BY ARCHIBALD RENFREW, M.R.C.V.S.,
*Broadway, Worcestershire.*

THE patient from which the photograph was obtained was a Jersey cow presenting the following symptoms:—

Losing flesh in spite of a fairly good appetite; breathing uneasily but not markedly abnormal; temperature slightly higher than average normal—102⅗; bowels very loose and bubbly.



Astringent and stimulant medicines tried without any success.

Animal tested with Bovine Tuberculin, without any reaction.

History of several cows having gone similarly and having been slaughtered.

Advised slaughter as I suspected Johne's disease.

The accompanying photograph is of the bowel of the animal after slaughter.

It would seem—so far as I am aware—that no cure is known for this disease which causes great loss in this part of the country.

## EXTRA-UTERINE PREGNANCY IN A HEIFER.

By A. LINTON ROBERTSON, M.R.C.V.S.,
*Arbroath.*

I RECENTLY got a message to go and see an Aberdeen Angus heifer, about 18 months old, that was unable to calve.

When I saw her she was chewing her cud. Some partially decomposed placenta was on the ground and some was protruding from the vagina. The sacro-sciatic and sacro-iliac ligaments, and the vulva, were relaxed, and the animal had all the appearances of being ready to calve.

As soon as I inserted my hand into the vagina all the placenta came away. The os was dilated and I had no difficulty in getting my hand into the uterus, but was greatly surprised when I could not feel a calf. I told the cattleman that she must have calved and that he had probably removed the calf with the manure in the morning when it was dark, but he would not listen to this. I then decided that I had a case of extra-uterine pregnancy.

I felt up the cornua as far as possible—I was stripped to the waist and have a long reach—and ultimately touched the foot of a calf

with the tips of my fingers. I had the abdomen of the heifer raised by a man on either side of her holding a sack, and managed to get ropes on to two feet—as the soles were up I thought them to be the hind feet of the calf. After trying in vain for about half an hour to bring the calf into the body of the womb, I advised the owner to slaughter the heifer as she was in good condition and of no pedigree value.

Unfortunately I was not at the abattoir to see the exact position of the calf in the mother, but during life it seemed to me as if it was in front of the rumen. The uterus, however, was removed intact and left for my examination.

I found the right Fallopian tube dilated to an enormous extent, and in it there was a fully-developed male calf rolled up into a ball. What I had thought to be the hind feet were really the front ones. I took the front feet and the slaughterman took the hind ones, and we pulled, but could not straighten out the calf.

It was a pity that all traces of the placenta had gone, but from the appearance of the cotyledons in the uterus it looked as if the placenta had been attached to them. To me this seems to have been impossible, and my own opinion is that fecundation had taken place in the Fallopian tube.

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## AMPUTATION OF THE UTERUS IN A COW.

By HOWARD COLET, B.V.Sc., M.R.C.V.S.
*Aylesbury.*

One morning last summer a message was received to the effect that a heifer had slipped her calf and that there seemed to be another "sticking out." On arrival, shortly after, the case was seen to be one of everted uterus. The heifer was in a large loose box and preparations were made to cast her, the intention being to have her down with her hind quarter well raised. As the heifer was troublesome, and even under ordinary conditions was not very safe where strangers were concerned, a preliminary dose of chloral was administered. Unfortunately, while preparations for throwing were being made, the heifer broke loose, charging through the door into the yard outside. When about half way down the yard one horn of the uterus fell off and the heifer, dripping blood, made off into a field in which the other cows were. With a little trouble she was returned to the loose box, when she immediately lay down. Chloroform was administered and the uterus amputated. This was done by two double pieces of strong unbleached tape driven transversely through the uterus and close to the vagina. A second couple of pieces of tape were driven vertically through and all tied as tightly as possible, quadrisecting

the uterus. Amputation was carried out about three inches behind the ligatures. The stump was returned to the vagina and the patient left. Visited again in the middle of the afternoon she was showing obvious signs of shock and normal salt solution to the amount of two gallons was administered subcutaneously. The method employed was to insert a long, large calibred hypodermic needle into the end of the rubber tubing of a quart douche tin. The tin was kept filled with hot normal saline solution and suspended a few feet above the patient. When the skin became distended the needle was inserted in a fresh place. The improvement as shown by the quality of the pulse was most marked. A second injection of a gallon of normal saline was made in the evening. The following morning the patient was for all practical purposes normal and recovery, assisted by vaginal injections, was uneventful.

This case has impressed on me the very great value of normal salt solution. At a later date it was employed in a milk fever case, which, after several visits with inflations and injections of adrenalin, looked like terminating fatally. The patient was an aged Jersey with a history of several attacks at previous calvings. As a last resort, and last thing at night, copious enemata of hot normal saline were employed. The result was a telephone message in the morning to say that the cow was up and feeding. No further visit was necessary.

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## Reviews.

### Annual Report of Civil Veterinary Department, Bengal, for the Year 1924-25.

ESTABLISHMENT :—

1 director and veterinary adviser ; 2 assistant directors ; 8 veterinary inspectors ; 188 veterinary assistant surgeons ; 41 veterinary hospitals and dispensaries.

EXECUTIVE WORK DONE :—

(a) Treated in Hospitals :

In-patients, 2,309 ; out-patients, 44,951 ; supplied with medicine, 7,536 ; castrations, 102.

(b) Treated on Tour :

For contagious disease, 27,850 ; for non-contagious disease, 48,382 ; castrations, 43 ; at headquarters, 18,619.

DEATHS FROM CONTAGIOUS DISEASES :—

Equines, 25 (16 from Glanders). Bovines, 21,696—rinderpest, 19,088 ; foot and mouth, 507 ; hæmorrhagic septicæmia, 1,546 ; black quarter, 8 ; anthrax, 217 ; other diseases, 330—rabies, 35 ; distemper, 76 ; fowl cholera, 33 ; not known, 36. Other animals, 180. Total, 21,901.

INOCULATIONS, 136,442 (203,989 in 1923-24) :—

Rinderpest, 126,963 ; hæmorrhagic septicæmia, 9,108 ; anthrax, 371.

The Report states that district boards are economising in veterinary

staff and curtailing funds for purchase of serum. The Government of Bengal have passed a resolution remonstrating with district boards on their attitude in these matters. Further, the Report states, the attitude of district boards towards veterinary work has affected the numbers of Bengali entrants to the Veterinary College, only 17 boys having applied for admission this year. Of the 98 students who have passed out qualified from the Bengal College in the last three years, 27 are unemployed! Under a heading, "Breeding Operations," the Report states that 145 stud bulls are maintained in various districts of the Province, as against 176 the previous year. District boards and municipalities are urged to provide funds for purchase and upkeep of more bulls of the right type, if improvement in the breed of cattle is desired.

THE BENGAL VETERINARY COLLEGE.

The Report states, the principal of the College is also in charge of the Raymond Research Laboratory, and of the Epizootic Diseases of Animals Department of the City of Calcutta.

COLLEGE STAFF :—

1 principal; 1 vice-principal; 1 assistant-principal; 5 lecturers.

The course is a three-years' course, and there are 132 students in residence at the College. The College hospital treated 2,088 patients during the year; about half of this total were canine patients.

The Raymond Research Laboratory appears to do very little research. Its work is chiefly confined to storage of serum and issuing this on demand.

The Epizootic Diseases of Animals Department tested 135 horses for glanders; 11 were destroyed, 41 died of glanders, 33 animals were destroyed for "Surra," and 14 died of "Surra."

Severe outbreaks of glanders and rinderpest are mentioned, and an outbreak of hæmorrhagic septicæmia among sheep at the Supply and Transport Depot; sheep which were intended for shipment to the Andaman Islands.

**Manual of Dairy Cattle Breeding.** By JOHN W. GOWEN, Ph.D. London: Baillière, Tindall & Cox, 1925. Pp. 113. 13s. 6d. net.

FOR the veterinarian whose practice is in a cattle-breeding district the methods by which a herd book is kept will always be of interest, and Gowen's Manual of Dairy Cattle Breeding, which follows on the same author's "Milk Secretion," is prepared for students who are primarily interested in this subject. The book contains a large number of herd book tables, particularly relating to the pedigree and conformation which deal with the production of milk and the milk yield. Nowadays, when dairy cows are bred almost entirely for this purpose, and everything else is sacrificed to the amount of milk and proportion of butter fat that a cow will give, the dairy farmer is compelled to work on scientific lines, and it is wise for his veterinary adviser to be *au fait* with at least the rudiments of what is running in the mind of his client.

**Veterinary Posology.** By G. A. BANHAM and W. J. YOUNG. London: Baillière, Tindall & Cox. 5th edition, pp. 359. 8s. 6d.

THE Fifth Edition of Banham's well-known Veterinary Posology will be welcomed equally by the veterinary practitioner and the veterinary student. It is brought, as far as is possible, up-to-date by numerous additions from the pen of Mr. W. J. Young. Published first in 1887, the

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work has been reprinted on no less than four different occasions in addition to reaching its fifth edition, and it is not an exaggeration to say that this little book is to be found on more veterinary bookshelves in the whole of the English-speaking world than any other book which the well-known veterinary publishing firm of Messrs. Baillière, Tindall & Cox has ever produced. It is a useful compendium of almost everything pertaining to veterinary science, and we have no hesitation in recommending it to everybody in the profession. If any word of criticism is to be applied, it is to be contained in an expression of surprise that the intra-dermal-palpebral test for glanders (which was so satisfactorily and universally used some millions of times during the Great War, and which has proved of such sterling value that the Coal Miners' Association insist upon it for the testing of the pit ponies at the present day) is omitted. It is to be hoped that this omission will be rectified in a future edition.

**The Fundamentals of Live-Stock Judging and Selection.** By ROBERT CURTIS, B.S.A. London: Henry Kimpton, 1925. 3rd edition, pp. 472, ff. 199. 15s. net.

THIS extremely useful and well-illustrated book, which is dedicated to students and stock men, is a useful survey of the breeds of horses, cattle, and other farm animals by Mr. Robert Curtis, who is in charge of the Animal Industry Division of the North Carolina Agricultural Experimental Station, and it can be read with profit equally by the judges of farm stock in Great Britain as in America. The types and breed characteristics of the different animals are excellently depicted, and in so far as the veterinary profession is concerned it is a work which should be recommended as a text book to the students of the first and third years. The science of Zootechny, so much neglected in our English veterinary colleges, is made a subject for special teaching and examination in the veterinary colleges of the Continent and America, and in these days, when the course which the veterinary student is compelled to take is so expensive that his parent or guardian fights shy of the payment of a pupilage fee for the teaching of the *practical* side of the profession, a book of this kind is as indispensable as any of the other of the text books which he is called upon to purchase. If the veterinary student of to-day could be persuaded to take a book like this to an Agricultural Show, he would learn in a few hours a great deal about the points and breeds of animals, and be better equipped than he is at present for discussing his future patients' in health with his farmer clients.

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## Notices

All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Gerrard 4646. Telegrams: "Baillière, Rand, London."

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